

McNeil Street Pumping Station

HAER LA-2

"Arsenal Hill"

Northwest end of McNeil Street at Cross Bayou

Shreveport

Caddo Parish

Louisiana

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9-SHREV,
2-

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ADDENDUM TO
MC NEIL STREET PUMPING STATION
McNeil Street and Cross Bayou
Shreveport
Caddo Parish
Louisiana

HAER No. LA-2

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9-SHREV,
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HISTORIC AMERICAN ENGINEERING RECORD
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HISTORIC AMERICAN ENGINEERING RECORD

SHREVEPORT WATER WORKS COMPANY:
MCNEIL STREET PUMPING STATION

HAER LA-2

Location: At northwest end of McNeil Street on Cross Bayou, Shreveport, Louisiana.
UTM: 15.428900.3598860
Quad: North Highlands

Date of Construction: 1887. Numerous changes to site, building, and equipment; last changes in 1980.

Present Owner: City of Shreveport
Department of Water and Sewerage
Shreveport, Louisiana 71101

Present Use: Municipal water pumping and filtration station. Steam-powered pumping equipment retired in 1980; other on-site structures and equipment still in use, along with some filters within station building.

Significance: The McNeil Street Pumping Station is typical of steam-powered municipal water pumping facilities of the late 19th and early 20th centuries for cities of moderate size. Its significance lies in its boilers and high and low service pumping engines which were all built before 1920 and used until 1980. At the time of their retirement, the McNeil Street Pumping Station was thought to be the last water facility still using steam-powered reciprocating pumping engines in regular service in the United States. The pumping engines may also be the last survivors of their type in or out of service in the country.

Historian: Terry S. Reynolds, August 1980.

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FORWARD

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"A CARDINAL NECESSITY"

The McNeil Street Pumping Station and the Evolution of the Water Supply System of Shreveport, Louisiana

"But the veriest tyro knows that pure water is a cardinal necessity of any city that would be worthy of the name." -- Mayor Samuel A. Dickson, 1915

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CHAPTER I

CISTERNS, SPRINGS, AND WELLS:

The Era of Household Supplies (1839-1887)

Shreveport was settled in the mid-1830s and incorporated as a town in 1839. Located at the head of low water navigation on the Red River, the city early became a commercial and mercantile center, attracting trade from eastern Texas, southern Arkansas, and northwestern Louisiana. By 1860, with a population of almost 3000 people, Shreveport was the largest city in northern Louisiana. [1]

THE DEVELOPMENT OF HOUSEHOLD SUPPLY SYSTEM (1839-1867)

While the Red River, with the transportation system it nourished, was early the key element in the growth of Shreveport as a commercial center, it was of no service in satisfying another urban need -- a supply of adequate drinking water. Red River water was not potable. Besides the obvious color problems, Red River water was turbid and hard. To make matters worse, natural salt springs on some of its tributaries and leaching from limestone and gypsum formations in its upper reaches gave Red River water a high chloride count (i.e., made it salty), especially during the low water summer months. [2] Thus the early settlers in Shreveport were compelled to turn to other sources for water.

In nineteenth century American cities these supplies were typically nearby streams or shallow wells. But the quality of surface water and shallow ground water in the Shreveport area, and much of the remainder of the South as well, was poor. The water in the bayous near Shreveport was as muddy or muddier than Red River water, and decaying vegetation gave it both taste and odor deficiencies. The ultimate source for much of the water in shallow wells was the Red River, so they shared many of the same deficiencies -- hardness, saltiness, and yellowish brown color. [3]

Before the advent of public water supply systems the standard resort in many cities (e.g., New Orleans) in areas where shallow ground waters and local surface waters were inadequate was cisterns. [4] These collected and stored rainwater runoff from the roofs of buildings. In the nineteenth century most middle and upper class households in Shreveport were provided with large wooden barrels or tubs. Located above ground and adjacent to the buildings whose runoff they collected, these tub cisterns were sometimes large enough to contain 25,000 gallons of water. [5] (See HAER photo LA-2-1) A few of the wealthier households and some of the larger business establishments, for fire protection, supplemented the surface tubs with even larger subterranean brick cisterns. [6]

Although there is no definite surviving evidence, wealthier Shreveport households in the nineteenth century probably followed the example of wealthy households in other cities where cisterns were employed, using hand-operated force pumps to lift water from their cisterns to storage tanks on top of their houses. These households may also have used small stone or charcoal filters. [7]

The water collected by the cisterns was potable and clearly of higher quality than Red River or bayou water. It was also soft and worked easily into a lather, making it useful for bathing, dish washing, mopping and scrubbing floors, and laundering clothes. But the cistern system had serious deficiencies. Most cisterns were left uncovered and provided breeding grounds for mosquitoes, small snakes, frogs, and other such animals. [8] Tub cisterns, when weakened by age, were subject to explosion, and, when this occurred, flooded nearby yards and offices. [9] The underground cisterns did not explode, but, left uncovered, were a hazard to unwary men and animals. [10] Cisterns were also expensive. They cost an estimated \$400 to \$500 (multiply by at least 5 to 10 to get the modern equivalent). [11] In times of drought the dwindling supplies in the cisterns stagnated and ran to "stringy dregs and wiggletails", before going completely dry. [12] Moreover, water quality decreased with the growth of cities, for increased volumes of dust, ash, and coal cinders accumulated on roofs and were washed into the cisterns by the rainwater. [13]

Partially due to these deficiencies cistern water was supplemented, particularly for drinking purposes, by water delivered by peddlers from springs located on the periphery of Shreveport. One of the more popular sources was Currie's spring, located approximately where Line Avenue extended would cut Louisiana Avenue today, then on the southeastern edge of the town. Smith's or Howell's spring also provided a supplementary supply. [14] But these supplies were inconvenient and expensive. Due to neglect or accident the two-wheel carts which delivered water to households often did not come when needed. When they did come the water was expensive, selling at 5¢ a bucket, 50¢ a barrel. In 1870 it was estimated that a family practicing "rigid economies" in the use of water had to spend around \$180 annually for supplies. [15]

Many families could afford neither large cisterns nor water carted in from springs. These had no choice but to rely heavily on shallow wells, regardless of the poor quality of water they provided. Fortunately, in early Shreveport peripheral springs and household cisterns provided much of the water needed, for shallow wells, in addition to providing water which tasted bad, were subject to contamination from human wastes (drainage from cesspools and privies) and were thus a potential agent for the spread of epidemic diseases like cholera and typhoid, two of the scourges of nineteenth century cities.

DISEASE AND EARLY EFFORTS TO DEVELOP A PUBLIC WATER SYSTEM

The threat of epidemic was very real in early Shreveport, for sanitary arrangements were primitive. Household garbage, slop, feces, urine, and other wastes were initially deposited where and when the individual householder elected. The town had no sanitary regulations and no municipal

collecting service. Vacant lots, streets, alleys, and back yards were all used, and swine were allowed to roam city streets freely, perhaps serving as garbage disposers. Feces and urine were deposited, at best, in a backyard privy, often all too close to the shallow wells used by the poor for drinking water. [16] Adding to the general filth of early Shreveport was the lack of public bathing houses. Because there were no public bathing houses and water was expensive, most poorer people did not bathe regularly. [17] Shreveport's condition was not atypical. Well into the nineteenth century most American cities were, by modern standards, filthy, and most city dwellers were expected to provide their own water supplies and dispose of their own wastes. [18]

Only in the late 1840s did the town's Board of Trustees begin to regulate sanitary conditions. Ordinances passed in 1849 required that all privies be sunk to at least 5 feet and that every householder from March 1st to December 1st remove, at least once every two days, all slop, filth, offal, litter, trash, and other offensive matter from his lot to a place beyond city limits. During winter months, when smells were not so offensive, the regulation was not in force. Every household was also ordered to use a tub or barrel to store slop and other wastes. The same set of ordinances declared swine a nuisance and ordered them removed from city streets and required that dead animals be removed promptly from within city limits by their owners. [19]

The passage of Shreveport's first extensive sanitary ordinances coincided with the town government's first attempt to develop public water supplies. In the summer of 1847 the Mayor and Board of Trustees of Shreveport appointed a committee to investigate the possibility of drilling an artesian well. [20] Artesian wells, wells where water is forced to the surface by pressure originating in a porous layer (aquifer) between two impervious layers, were a highly desired source of water in the nineteenth century. Water in the aquifer was protected from surface contamination by the impervious strata which overlaid it and was often, but not invariably, soft and clear. Moreover, artesian wells did not require expensive pumping equipment to bring water to the surface. This was a critical matter, for Shreveport's city government, like city governments throughout early nineteenth century America, had sharply limited financial resources. Shreveport's 1839 charter limited municipal taxation to \$1000 annually. [21]

The advocates of artesian supplies, however, often had highly inflated ideas about the quality, quantity, and accessibility of the water they sought. [22] This was the case with Shreveport. Unknown to the town's Trustees, the water in the aquifer underlying Shreveport was neither abundant nor of superb quality. It was relatively hard. And it was deep. The water bearing sands beneath Shreveport are around 220 feet down, and pressure from the aquifer is only sufficient to push the artesian waters to a height of 180 feet, leaving it still around 40 feet beneath the surface. [23]

Unaware of the problems and limitations of the supplies they sought, the Trustees in the spring of 1848 accepted a proposition from A.T. Alfred to bore or dig for water anywhere in the corporation limits under their supervision. The Trustees appropriated \$250 for the project and promised Alfred

an additional \$1.25 per foot plus the expense of the lead pipe if he were successful and brought water to the surface. The attempt was made at the corner of Edwards and Travis streets, but the shaft was abandoned after Alfred had hored down around 100 feet without success. [24]

In March 1850, still convinced that artesian springs were feasible, the Board of Trustees retained another firm, Taylor & Estes, to continue the work abandoned by Alfred. The Trustees offered Taylor & Estes \$1.00 per foot drilled in the first 100 feet of shaft (partly drilled already), \$1.50 per foot for the next 100 feet; \$2.00 per foot for the third 100 feet and so on. To insure that work continued until successful or until the Board was satisfied the project was not feasible, Taylor & Estes were required to post bond. [25] But results were no better.

Besides attempting to secure artesian waters, the Board of Trustees also took steps to increase the supply of water from more conventional sources. In the spring of 1849, for example, it voted to permit John Howell to convey water in underground iron or lead pipes from Howell's (Smith's) spring down Edwards Street for a small annual fee. [26] A year later the Board voted to allow citizens of the 4th Ward to build a public well at their own expense on Spring or Lake Street and authorized the Mayor to purchase a pump for the well when it was in working order. [27] To protect public wells like this one from commercial exploitation the Trustees in September 1850 prohibited hauling of water by barrel from them. To protect public wells from contamination the Trustees prohibited the washing of clothes in their vicinity. [28] Efforts to secure city services, like water supplies, in cooperation with private individuals, like Howell, or groups, like the citizens of the 4th Ward, were typical of ante-bellum Southern cities and were necessary because of the shoestring budgets that most Southern cities operated with. [29]

The sudden burst of activity in the area of sanitation and water supply in Shreveport in the period between 1847 and 1850 was probably prompted by the epidemic of typhoid fever which struck settlements in western Louisiana in 1847, [30] in conjunction with standard medical responses to epidemics in the era. The prevalent theory of disease was the "miasmatic" theory, which held that diseases were caused by the spontaneous generation of disease agents in filth and moisture festering under hot, humid conditions. Although the theory was erroneous, many of the actions it prompted were beneficial. For instance, proponents of the miasmatic theory emphasized personal and municipal cleanliness as the best defense against the introduction of disease agents. This involved massive attempts to clean up garbage, household wastes, and other forms of sewage from streets and vacant lots, as well as the elimination of stagnant bodies of water. The development of more abundant supplies of water was also encouraged by those who saw a direct correlation between filth and disease, for large quantities of water were needed to keep streets clean, gutters flushed, and to insure personal cleanliness (bathing) and household cleanliness (washed dishes, mopped floors, etc.). [31]

In the eighteenth and early nineteenth centuries the first ventures by urban governments into the public service area were often prompted by epidemic. For instance, yellow fever epidemics were important to the improvement of . .

sanitary conditions and the development of water supplies in New York, Philadelphia, and Baltimore. [32] Shreveport's sudden interest in cleanliness and improved water supplies after the 1847 typhoid epidemic would certainly seem to fit into this tradition.

Shreveport's later actions in the area of sanitation were also in the nineteenth century American urban tradition. Since epidemics did not occur every year, the fear, as well as the sanitary efforts they had inspired, decreased with every year that epidemic did not strike. The provisions of sanitary ordinances soon went unenforced; efforts to secure supplies of pure water were tabled. This neglect was encouraged not only by the absence of disease but also by disagreements in medical circles. A substantial school of thought, for example, rejected the cleanup campaigns inspired by the miasmatic school and advocated quarantine instead. [33] It was thus easy to return to old habits after a few years of relief. Such was the case with Shreveport. The 1849 sanitary ordinances were not enforced, and the city was soon as filthy as ever. [34] By 1873, when a massive yellow fever epidemic hit the city, it was "reeking with filth" and even the most elementary sanitary regulations were being completely disregarded. [35]

In many cities the first rudimentary public water supply systems emerged from the fear of disease and attempts to fight it. [36] But the failure of the artesian experiment in Shreveport in 1850 prevented disease from being the effective stimulus. Neither did the fear of disease lead to any sustained drive toward the development of water supplies in Shreveport. Efforts to water the city, like efforts to keep it clean, were sporadic and largely ineffective for several decades following 1850. In 1860 and again in 1866 the Board of Trustees attempted to find parties to bore artesian wells for the city, apparently without success. [37] In 1873 the city government authorized P.R. Graves to sink an artesian well at his own expense in the city limits, requiring that the well be sunk at a point designated by the Administrator of Improvements and that he give the city water free of charge for "sanitary and other purposes." But this attempt to tap artesian supplies met with no more success than earlier ventures. [38] These failures left Shreveport in the late nineteenth century still dependent on cisterns, springs, and wells, supplies that became increasingly inadequate as the city grew larger.

FIRE AND THE EMERGENCE OF GREATER MUNICIPAL INVOLVEMENT IN WATER SUPPLY (1867-1883)

Fear of disease and the desire for clean potable water in quantity were insufficient stimuli for the development of public water supply in Shreveport. The supplies that could easily and cheaply be tapped by the city were of too poor a quality, and the city government was too poorly funded to undertake ambitious projects to secure better. Thus in Shreveport the most important pressure for the creation of public water supplies was not disease or a demand for potable water, but fire.

Several factors account for the greater importance of the fire danger in creating the environment that led to extensive municipal involvement in water supply. Fire was a more serious threat to the commercial and mercantile interests which controlled municipal governments like Shreveport's than disease

or poor drinking water. Epidemics were not a constant danger. Years might separate one outbreak from the next. And when one did strike, the wealthy could flee town. The wealthy were also not overly concerned about the expense and limited supplies of potable water. They could afford the expensive water delivered from peripheral springs. Fire, on the other hand, was an ever present danger and harmed the rich, with their extensive commercial and residential properties, more than it did the poor, especially since arson was among the most common of crimes in early nineteenth century Southern cities. [39] Fire was always a major danger in urban areas in the nineteenth century. [40] In frontier towns like Shreveport, where the proportion of wooden buildings was far higher than in eastern urban centers, this was particularly the case. Even a small blaze, fanned by light winds, quickly spread from structure to structure, threatening the entire city. An 1854 conflagration, for example, burned almost a dozen businesses before the city's primitive pumping engines and fire brigades contained it. [41]

In these circumstances it is not surprising that the first municipally owned water supply in Shreveport was created for the purposes of fire protection rather than for public health or domestic uses. All over America fire protection was among the earliest services provided by municipal governments and served as a precedent for expanding the role of municipal government in the water supply area. [42]

In 1866, in order to provide the city's volunteer fire companies (in existence since 1847) with sufficient water to fight fires, Shreveport's Board of Trustees authorized the construction of four large subterranean cisterns at \$100 each. These structures were built of brick and concrete, with walls 12 inches thick, and bottoms 18 inches thick. Approximately 20 feet deep and 16 feet in diameter, with a capacity of 30,000 to 50,000 gallons, they caught and stored rainwater runoff from the streets. (see HAER photo LA-2-2) The first four municipally owned fire cisterns were all located in the business district of the city (see Table 1). One was placed behind the old Market House in the middle of Market Street; another near the Court House on Texas Street; a third at the corner of Fannin and Edwards streets; and the fourth at the corner of Market and Crocket streets. [43]

Several of the cisterns were completed as early as February of 1867 by a local firm, Smith & Johnson, and were inspected and approved by the city. [44] By the end of the month one of these, the 30,000 to 40,000 gallon cistern on Market and Crocket, had been filled with Red River water by the steam pumping engine of the Fire Department and was ready for use. [45]

In May of 1867 the Board of Trustees appointed a committee to examine the two remaining cisterns. [46] The committee found work lagging. Thus in June the Board passed an ordinance requiring completion within two months. [47] But as late as February of 1868 the two remaining cisterns had still not been examined and accepted by the city. [48] Only in May of 1868 was the Market Street cistern accepted and the Mayor authorized by the Trustees to make payment. The cistern near the Court House (on Texas and McNeil) was rejected due to leakage. [49]

In June of 1869, pressed by E.M. Smith for payment, the Board authorized a new test of the Texas & McNeil cistern by the fire department. [50]. By this time, however, the city had begun to have leakage problems with

SHREVEPORT

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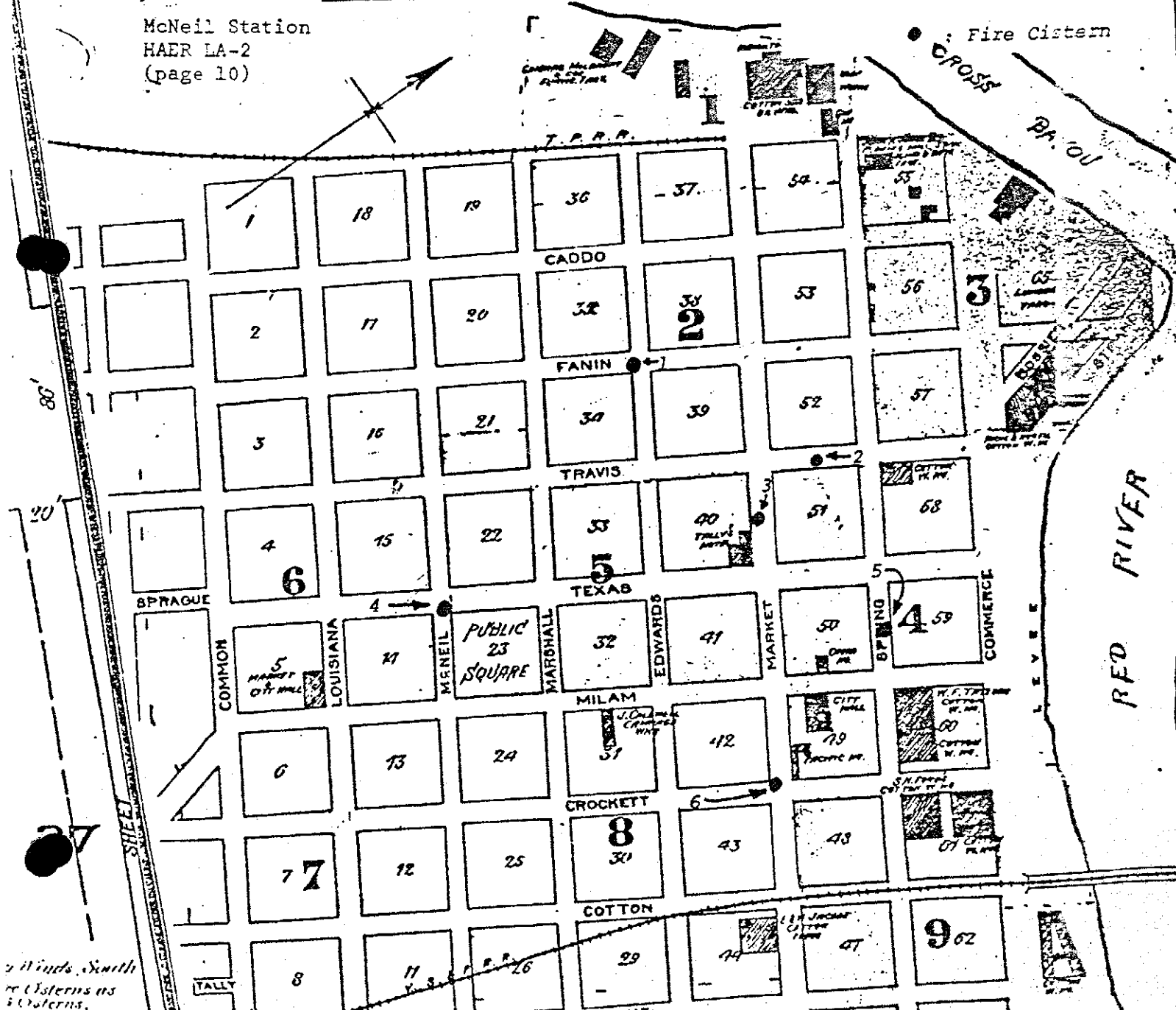
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Table 1: The Six Fire Cisterns of Shreveport, cl885

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(page 10)



several of the cisterns already accepted, particularly the one on the corner of Crocket and Market. [51] In March 1870 the Board authorized the Committee on the Fire Department to contract for repairs for these cisterns, suggesting that wooden cisterns be sunk inside the existing concrete and brick structures. [52]

The use of wooden liners in the defective cisterns apparently alleviated some of the problems. In December of 1871 the Assistant Fire Chief noted that except for the cistern on Market Street ("for a long time in bad condition"), the cisterns were "in good repair." [53] But repairs to the fire cisterns remained a minor source of irritation for years. In 1872, for instance, the city had to appropriate \$250 to repair and fill the cisterns. [54] In 1876 the Fire Department asked that the cistern on Market Street, apparently still causing problems, be repaired. [55] And in 1877, the Fire Department again reported that some of the cisterns were in need of work. [56]

The original four fire cisterns were supplemented with a least two additional fire cisterns between 1870 and 1885 (see Table 1) and possibly more. [57] In addition, plans were made in 1873 to supplement the cisterns with water from five city wells. [58]

If anything, however, fire cisterns were more inadequate for fire protection, than household cisterns for providing drinking and washing water. As usual with city services in the nineteenth century, all of the fire cisterns were located to serve the heavily built up downtown area of Shreveport. [59] The outlying areas, the areas where the poor and the black lived, were totally unprotected. Protection was even dubious for structures located close to the cisterns. Since the Fire Department often depended on rainwater to fill the cisterns, they often ran low in times of drought. And because the Fire Department relied on steam and hand engines to pump water from cistern to fire, there were other problems. The pumping engines had to be drug from the fire station over streets sometimes so muddy that a four-yoke oxen team bogged down. And even if, after delays due to muddy streets, the engines were linked to the cisterns, they could only throw a few feeble streams against fires.

The deficiencies of the cistern system were widely recognized. A fireman in 1871, for instance, pointed out the limited area of coverage, the high cost of building and maintaining the cisterns, the delays involved in getting pumping engines to the cisterns, and the deficiencies of the fire streams even when the engines were placed. He blamed the fire cistern system of fire protection for the high insurance rates being charged in the city. [60] An assistant Fire Chief in 1877 informed the City Council (Board of Administrators) that a general water system was needed instead of the cisterns. [61] The Sanborn Insurance Company, publisher of insurance maps, summarized Shreveport's fire water system in a few brief words in 1885-- "Water facilities: Not good." [62]

In spite of the recognized deficiencies of the water supply system in Shreveport, both from the standpoint of domestic use and from the standpoint of fire protection, deficiencies which grew more acute as the city grew

larger, no serious remedial actions were taken until the 1880s. In part this was due to the troubles caused by war, reconstruction, and the panic of 1873. In part it may have been due to the continued hope of securing natural flowing artesian waters. But other factors were more important. For instance, Southern cities tended to have and to spend far less public funds than Northern cities, and hence had less monies for the development of water supply systems. [63] In part this was due to the larger number of poor (especially Blacks) in the South, but in part this was also due to economic philosophy. Southern businessmen and municipal leaders preferred to keep taxes (and hence municipal revenues) low in hopes of attracting industry. [64] Moreover, in spite of having lower taxes than many Northern cities, Southern merchants and businessmen believed they were overtaxed and resisted further attempts to raise taxes. For example, Caddo Parish's delegate to the 1879 Louisiana Constitutional Convention complained of "exorbitant" municipal taxes. [65] In large part this belief and the resistance to new taxes which it provoked were due to the very, very low taxes of ante-bellum years which made the post-war tax rate seem higher than it really was. [66]

But probably the single biggest factor which inhibited effective municipal action on water supply, as well as other urban services, in the mid- to late nineteenth century was the railroad. The merchants and businessmen who dominated municipal governments felt with considerable justification, particularly in inland cities like Shreveport, that the future growth of their communities was dependent on the railroad and that encouragement of railroads deserved top priority. [67] Thus when the need for adequate water became serious in Shreveport after the War Between the States, the city government was too heavily involved in financing or encouraging railroads to devote much time or money to water problems. The priority given railroads over water supply is graphically illustrated by events in Shreveport in the 1870s.

Around 1870 Birdsill Holly, of Lockport, New York, a manufacturer of steam pumping engines, began soliciting water franchises. Using pumps and equipment manufactured by his firm in a direct pressure system (i.e., a system with no reservoirs or storage tanks), he offered to build water systems which would supply on demand a fire stream with 100 pounds pressure. He asked, in return, a certain annual fixed subsidy based on the number of fire hydrants furnished, and he asked for exclusive rights to furnish water. [68]

In 1871 Holly contacted Shreveport officials. Details of his proposal to the city are not completely clear, but from available evidence it appears that Holly offered to lay 5 miles of pipe with fifty hydrants within four months. His pumping system was guaranteed to deliver water to the mains with a pressure sufficient to throw six fire streams from a 1.25-inch nozzle 100 feet high. He also offered to provide the city with free water for washing and sprinkling streets. In return, Holly requested the city to grant his company a thirty year franchise and issue it \$100,000 in thirty year bonds. [69]

Considering the city's precarious water situation, the offer was attractive, and an anonymous "Fireman" urged the City Council to accept it. He claimed that high annual water costs were limiting population growth, that poorer people in Shreveport could not afford to bathe, that the system was

absolutely necessary for fire protection, and that it would cut insurance costs. He also estimated that water supplied by Holly would cost about 10% of that presently supplied the city. [70] He was backed by one of the local newspapers. It noted that the water question was "a serious one," that the Holly system would be a "great convenience," and urged that the issue be submitted to a vote of the taxpayers. [71]

However, the merchant dominated Board of Trade, one of the most powerful institutions in urban areas in the nineteenth century, sharply reacted against the idea. In June 1872 the Board of Trade passed a resolution "solely protesting" the plan to adopt the Holly system because of the "exorbitant price demanded" and the "heavy tax" that it would impose on property holders. Shreveport, the Board argued, did not really need a water works. [72]

The reaction of the city's propertied interests to much more expensive railroad proposals in the same era indicates that it was more a matter of priorities than high taxes. In the 1870s city property owners voted to approve a forty-year, \$500,000 bond issue for the New Orleans, Baton Rouge, and Vicksburg Railroad, which was to link with the Texas Pacific system. When this project failed, the Board of Trade and the City of Shreveport accepted an offer from the Texas & Pacific Railroad (successor of the Texas Pacific), which involved the purchase of \$130,000 of land to provide depot and yard facilities for the eastern terminus of that line. To secure these lands the city was prepared to issue \$260,000 in bonds and sell them at 50% of par value. [73] Further, in 1875, while sinking in a morass of debt over the Texas & Pacific bond issue, the city subscribed several hundred thousand dollars for the Southern Rio Grande Railroad. [74] Even though a general water system would have cost considerably less money than subsidies to railroad lines, the latter was clearly the focus of municipal efforts in the 1870s and tended to divert attention and funds from the solution of water supply problems.

THE DRIVE FOR A GENERAL WATER SUPPLY SYSTEM (1883-1887)

Only in the 1880s was serious consideration again given to developing a general system of water supply for Shreveport. The human catalyst of the drive was Andrew Currie, a large property holder, who was appointed by the Governor of Louisiana as the first Mayor of Shreveport under the new charter granted the city by the State Legislature in 1878. [75] Currie proved an excellent selection. Overzealous support for railroads, the financial panic of 1873, and reconstruction government had placed the city in very precarious financial straits. When Currie took office the Fire Department's engines and other apparatus had been seized by the Parish Sheriff and creditors were threatening to confiscate all of the city's real property. [76] But by 1884 Currie and the City Council had stabilized the city's finances. During his long term in office (1878-1890), Currie curbed the excesses of the city's railroad mania, but still succeeded in attracting new lines into the city.

Currie's administration was also noted for the expansion of city services. For example, beginning in 1882 or 1883, and culminating in 1887, Currie and the City Council were involved in a sustained drive to bring the city a general water supply system. The immediate stimulus for the attempt

was probably a series of serious fires in the early 1880s. In May of 1880, for instance, a fire spread from a family grocery to adjacent structures and was barely contained from spreading further. [77] In August of 1881 another blaze destroyed \$10,000 to \$20,000 in property. This fire revealed quite dramatically the deficiencies of the existing municipal fire water system. The Fire Department made use of two cisterns in fighting the fire, but there had been a long drought. One of the cisterns was low on water, and its supply gave out in the middle of attempts to douse the blaze. Only after the damage had been done did the Fire Department use its steam pumps to refill the cisterns from the river. [79] Since Andrew Currie was an insurance agent [80], as well as chief executive officer of the city, he had a double interest in preventing the recurrence of such catastrophies.

Even if these fires did not provide the initial stimulus behind Currie's search for better water supplies, fire protection seems to have been the primary reason a general water system was desired by Shreveport's City Council. Much more attention was devoted to fire pressure than to water quality in the contracts the city sought or negotiated in the 1883-1886 period, and even the newspapers gave precedence to fire protection over the domestic and sanitary uses of water. For example, the Shreveport Times in December 1885, in commenting on the need for a water supply, emphasized not the poor quality or high price of existing supplies, but their inadequacy for fighting fires. These supplies, the Times noted, had been inadequate for fire purposes on several occasions, and engines "repeatedly" had had to stand idle at fires because there was no water. [81]

The evidence is not completely clear, but the drive for a general water system to replace the fire cisterns apparently began in 1882 or early 1883 when Andrew Currie began seeking a remedy for the city's fire ills and solicited proposals from several private water companies. On February 1, 1883, he announced to the Council that he had received propositions from two parties interested in reaching some agreement. [82] At the May meeting of the Council he presented the details of their propositions, commenting that there was a growing demand for a general water system and that it was an "absolute necessity" to build a water works. [83] Details of the two proposals were ordered published by the Council for public review and discussion. [84]

Shreveport had little choice but to resort to a private franchise to secure a general water supply system, in spite of some local agitation for municipal ownership. [85] The city's financial situation was better in 1883 than it had been five years earlier, but it was still precarious. At the very meeting where Currie presented the water works proposals, he warned the Council of the necessity of cutting back expenses everywhere possible and of the importance of maintaining "the strictest economy in all branches of the city's affairs" in order to pay off the municipal debt and deliver the city from "an incubus that has long been weighing it down." [86] Had the city not just emerged from a position of nearly defaulting on previous bond issues, it could perhaps have issued bonds to raise money to build a water system on its own. But after the bond disaster of the 1870s Currie and the Shreveport business community were understandably reluctant to issue more bonds, and potential buyers of the bonds were likely to be reluctant to purchase them at anywhere near par value, if at all. [87]

Increased taxation to raise money for water works was also out. The Louisiana Constitution of 1879 limited local taxes to a paltry 10 mills. Additional taxes of no more than 5 mills could be assessed for a limited period of time (no more than 10 years) for the support of public improvements and railroads when approved by a majority of all recorded taxpayers and assessments. [88] But with the business community still giving railroads high priority (in July 1884, for instance, the property taxpayers voted a special tax of 5 mills until \$75,000 was raised to support a railroad to be built to Logansport on the Sabine River [89]), there was little likelihood of securing passage of the necessary taxing authority. Shreveport's situation was described by Engineering Record in the mid-1880s:

a city . . . which is more or less in debt, and in which it is almost, or entirely, impossible to secure the passage of the necessary laws to provide by taxation for the construction of a proper system of sewerage on account of the opposition of certain property holders, the exigencies of 'practical politics,' so-called, etc., etc., . . . [90]

Thus, Shreveport's precarious financial condition, a reluctance to issue bonds, the continued interest of area businessmen in attracting railroads and limiting taxation, both in their own interests and in hopes of attracting industry, made the decision to seek a private water works company all but inevitable.

In turning to a private company, moreover, Shreveport was also consistent with the trend of the times. Throughout the nineteenth century most small and medium size cities, when initially contemplating a general water system, drew back from the heavy expenses involved in constructing their own works and turned to private companies. [91] The period between 1880 and 1895, in particular, saw a massive increase in the number of privately owned water systems. The water works industry boomed during this period, partially stimulated by urban growth and economic prosperity. [92] But growth was also encouraged by private promoters who actively solicited franchise agreements, concentrating heavily on small to medium cities which, left entirely to their own initiative, would not have acquired water works for some years. [93] Of the 1280 municipal water systems erected in the 1880s, 60% were privately owned. [94] Southern cities and cities of under 10,000 people, categories into which Shreveport fit, were most likely to turn to or be approached by private promoters. In 1888 around 56% of the water works in the country were privately owned. The figure for the deep South was 73%. [95] Shreveport's population in 1880 was 8009 and in 1890 was 11,979. In 1891, among Southern cities between 5000 and 20,000 people, 66% had privately owned water systems (the figure was 61% for the United States as a whole). [96]

The propositions which Andrew Currie presented to the City Council and to the City of Shreveport in May 1883 were typical of those being offered by private companies to cities like Shreveport in the 1880s. One of them was from J.S. Drake of Rock Island, Illinois, who had apparently constructed several water systems for Texas cities. [97] Drake promised to install not less than 5 miles of mains with sixty double nozzle fire hydrants, linked to a pumping plant with a capacity of 1 mgd (million gallons per day). The hydrants were to be able to discharge five fire streams 100 feet high through

1-inch nozzles and 50 feet of 2.5-inch hose. Drake also agreed to provide the city with free water for flushing sewers, for fighting fires, for city buildings, and for a fountain in a city park. He promised not to charge private customers more than 2¢ per barrel of 40 gallons for water. In return Drake asked a thirty year exclusive franchise and \$6000 annual rental on the hydrants. He agreed to extend the mains when the city ordered not less than twelve additional hydrants per mile of extension at an annual rental of \$80 each (\$50 each after the one hundredth hydrant). The city was to be able to purchase the works at the end of ten years or at any time thereafter at a price to be set by a board of appraisers jointly appointed by company and city. If the city refused to buy at the end of the thirty year franchise period, all rights were to be extended another thirty years. [98]

The other proposal, from the North American Construction Company of New York, which claimed to have constructed several works in North Carolina, was similar (see Tables 2 and 3). [99] North American Construction promised to deliver 75 gallons per capita per day (= c0.75 mgd), to charge only \$60 each for annual fire hydrant rental (\$50 each over one hundred), and offered slightly better fire pressure guarantees. Rates for individual consumers were to be set by taking the average of rates charged in other cities of comparable size, but not to exceed 2¢ per barrel or 50¢ per 1000 gallons. [100]

Press reaction to the proposals was favorable. The Times, for instance, hoped that the best proposition would be accepted at the next regular meeting of the Council. [101] And although, less than a week later, it advocated the city building its own system, several letters to the editor printed in the Times noted that this was nearly impossible and urged the city to proceed with acquiring a privately operated general water system. [102]

Neither of the two initial proposals was accepted. This was probably because Currie and the City Council had hopes of securing even better propositions by advertising more widely. There were good reasons for this hope. By the May 3, 1883, Council meeting when the Drake and North American Construction proposals were read, Drake had already agreed to improve his fire pressure gurantee. [103] A week later, as the two propositions were being published in the newspapers for purposes of comparison and discussion, Patrick J. Kennedy of New Orleans, an iron manufacturer, telegraphed asking for the privilege of bidding. [104] Thus, an anonymous "Tax Payer" speculated:

No doubt plenty of bidders will appear. In the mean time keep up the discussion. Water works will save our property, save high rates of insurance, improve the sanitary conditions, and give men, animals, and washerwomen plenty of water. [106]

The priority given fire protection in the list is probably no coincidence.

In September of 1883 the City Council formally advertised for sealed proposals for the construction of water works for "fire protection, domestic use, and other purposes." The city asked that bidders provide 80 gallons per capita per day for a population of 12,000 people (c0.96 mgd), 6 miles of mains, and seventy hydrants, plus free water for city buildings, the Fire Department, public schools, parks, and for flushing gutters. The city's

Table 2: Comparison of Proposals and Franchise Ordinances for the Water Supply System of Shreveport, Louisiana, 1883-1886

Company:	Drake	No. Amer. Const.	City Request	Kennedy	Perkins	Coats/Bullock*
date:	1883	1883	1883	1884	1885	1886
length of franchise:	30	10(?)	--	30	20	30
year purchase first possible:	10	10	--	10	15	30
pumping capac. of system (mgd):	1	0.75 (75 gpcd)	cl.0 (80 gpcd)	1	2 (filtered)	2 (filtered)
hydrant rental (\$/yr.):	1-60: \$100 61-100: 80 101- : 50	1-75: \$60 76-100: 60 101- : 50		1-70: \$90 71-100: 80 101- : 50	1-80: \$75 81- : 60	1-106: \$50 107- : 40+ 7% cost of extending mains...
cost for rental of 106 hydrants:	\$9500	\$6300	--	\$9000	\$7560	\$5300**
miles of mains:	5	7	6	7	8	8.5
fire pressure requirements (# of streams 100 ft. high using 1-in. nozzles):	5 (thru 50' of hose)	5 (thru 250' of hose)	8 (thru 350' of hose)	5 (thru 500' of hose)	8 (thru 50' of hose)	6 (at 50 psi pressure)
domestic consumer rates:	max. of 2¢ for 40 gal. barrel	max. of 2¢ for 40 gal. barrel		flat rate schedule + metered rate of 20-50¢ per 1000 gal.	flat rate schedule	flat rate schedule + metered rate of 30¢ per 1000 gal.

*The franchise ordinance accepted by Bullock was substantially the same as the the specifications for the system prepared for the city by J.R. Coats.

**In addition to building a water supply system, Bullock was required to provide the city with a sewerage system. He received an annual rental of \$3000 per year for the use of this system from the city. If the system had to be extended at the city's request, Bullock received an annual rental set at 7% of the cost of the extensions.

Table 3: Comparison of Selected Domestic and Commercial Flat Rate Charges from the Schedules in the Three Franchise Ordinances Passed by the Shreveport City Council between 1884 and 1886

	Kennedy (1884)	Perkins (1885)	Bullock (1886)
Residences			
-service connection to a house of 4 rooms or less	\$6	\$6	\$6
-charge for each additional room	2	1	1
-private bathtub	5	3	3
-water closet	10-25	5	5
-outside sprinkler	-	-	3
Hotel or public bath tub	10	4-8	10
Public urinal	12-25	5	5
Sleeping room (lavatory only?)	-	2-4	2-4
Barber shop, per chair	6-9	3	3
Saloons	15-50	15-30	15-30

specifications were very similar to the proposals made by Drake and North American Construction a few months earlier (see Table 2). But because the need for fire protection provided the stimulus for acquisition of a system, the city sought better fire pressures, requiring that bidders provide a system capable of furnishing water simultaneously to eight fire streams 100 feet high through 350 feet of hose and a 1-inch nozzle. Bidders were also required to post \$10,000 bond as evidence of the sincerity of their offer. [106]

The invitation for bids did not attract as many parties as the city had hoped. When bids were opened on November 15, 1883, there were only two -- one from North American Construction Company and one from P.J. Kennedy. Their proposals were read and referred to committee for more thorough examination. [107] On December 6, 1883, the committee asked for more time and requested the City Controller to write to the two bidders asking that they meet with the committee. [108] Only one of the bidders -- Kennedy -- appeared at the February 15, 1884, meeting, and, after discussing with the committee the extent of the territory to be covered by the system, he asked permission to withdraw his bid, asserting that he could not carry out the requirements of the Council under his bid. [109]

Thus the committee recommended to the full Council on March 6, 1884, that the city readvertise for bids, rejecting all previous proposals, but giving those interested a chance to "modify or reconstruct" their proposals for resubmission on April 3, 1884. [110] This ploy was apparently designed to give Kennedy a chance to submit a bid he could work with, for the Mayor in his remarks of the evening noted: "The scheme for water works is in a fair way of reaching a satisfactory conclusion . . ."

At the April 4, 1884, meeting Shreveport's City Council accepted Kennedy's modified bid and awarded him a franchise to supply the city with water. Kennedy was required to provide a system with 7 miles of mains and seventy hydrants laid "as the Council may designate so as to best protect the property of the city and the inhabitants thereof from fires." His pumping plant was to have a capacity of 1 mgd, but with overload capacity up to 1.5 mgd, and the ability to provide the Fire Department with five fire streams 100 feet high through 500 feet of 2.5-inch hose and 1-inch nozzles. He was to provide the city with free water for flushing sewers, fighting fires, for public offices and schools, and for one fountain in a city park (during limited hours). In return Kennedy was granted a thirty year franchise and guaranteed rental from the seventy hydrants at a rate of \$90 each. Extensions were to be made by Kennedy when the city ordered, but with no less than ten hydrants per mile on such extensions at an annual rental of \$80 each (\$50 each for hydrants in excess of a hundred). A flat rate schedule was established for private consumers, and the usual provision for sale at a price set by a board of appraisers at the end of ten years was included in the franchise ordinance. Work was to commence on the system in ninety days and be completed within a year. [111] (See Tables 2 and 3 for comparisons with both previous and later franchise proposals)

Kennedy presented bond to the city in June, and it was formally accepted in July. [112] But Kennedy never carried out the terms of the franchise ordinance. At the September 11, 1884, meeting the Council referred the bond

and contract to the city's attorney, asking him to consider bringing suit against Kennedy for non-compliance. [113] The cause of the difficulty between Kennedy and the city is unknown. Kennedy may have been having financial problems which made him reluctant to undertake the Shreveport job, or he may have been reluctant to tackle the job due to lack of experience in the water works field. [114] Or, perhaps, he may have become involved in a dispute with the Council over the source of water he would use. The Council, as late as December 1885, pushed potential franchise contractors to use water from Howell's spring or deep wells, [115] supplies that private contractors may have felt were inadequate in quantity or too expensive to tap.

After the failure of the Kennedy franchise ordinance, the City Council delayed for a year before taking further action. But on September 10, 1885, it authorized its Fire Department Committee to again advertise for bids for a water system. [116]

The new request for bids attracted three responses. [117] Two were from minor firms -- Horace A. Keefer of Kansas City, Missouri, and O.J. Gorman of Dallas, Texas. The third was from a firm which had constructed a number of water works, including those in Geneseo, Illinois; Red Oak, Iowa; Parsons, Kansas; and a half dozen Missouri cities -- the Perkins Water Works Company of Springfield, Missouri. [118] At the November 12, 1885, meeting the bids were referred to the Council's Fire Department and Water Works Committee, [119] and at the December 10, 1885, meeting, with P.B. Perkins present, that Committee recommended acceptance of the Perkins bid. [120]

There was one provision in the Perkins proposal, however, which the Council found objectionable -- the source of water supply. Perkins planned to use Cross Bayou, a small stream which formed the northern boundary of the city. The Council argued that much better water, in sufficient quantity, could be obtained from around the Howell springs, and that 50% more water would be consumed if it were supplied from this source rather than Cross Bayou or the Red River. [121] Perkins was invited to attend the December 10 Council meeting, and, together with his engineers and members of the Council, he inspected potential sources of water the following day.

The franchise ordinance passed by the City Council on December 11, 1885, gave Perkins the source of supply he wanted -- Cross Bayou --, but required that the water be filtered and purified. The Perkins franchise involved more miles of mains and a larger pumping capacity than previous proposals (see Table 2), the use of sedimentation basins and filters (not mentioned in previous proposals or ordinances), and the use of a reservoir or water tower in the system (also not included in previous proposals or franchise ordinances). The franchise ordinance contained the usual provisions for free water for municipal use and determination of price for city acquisition at the termination of the franchise period. Perkins was required to provide the city with an electric fire alarm and to complete work on the system by July 1, 1886. [122] (The source of water supply Perkins was to use, Cross Bayou, is shown c1912 in HAER photos LA-2-101 and LA-2-102)

Perkins formally accepted the franchise ordinance on December 20, 1885, [123] but in March 1886 withdrew from the contract. [124] There is no indication in City Council minutes of the factors behind this withdrawal. It may well have been the filtration requirement. Filtration of silt laden waters like those of Cross Bayou was practically a new art in 1886 (it had been successfully initiated only in the early 1880s with the advent of rapid sand filtration [125]), and Perkins may well have been reluctant, on serious consideration, to undertake a franchise which required it.

This forced the Council to again consider an invitation for bids, and another committee was appointed for that purpose. But this time the committee was instructed to request bids for both a water and a sewerage system. [126]

Why this alteration was made is not certain. But there are several feasible reasons. First, Shreveport clearly was in need of a sewerage system. In 1879 and 1880, in an attempt to mollify some of the serious health hazards of the traditional cesspool and privy system, the Council had adopted the "tub system" of sewage disposal. This required all privies to be equipped with a box or tub. Feces and urine were deposited in it. Every two days at sometime between 11 p.m. and 4 a.m. a city waste collector (vidangeur) was required to empty these tubs and deodorize and disinfect the privies. The wastes were then carted to the Red River, below the city, and dumped. [127] While a sanitary improvement over the old system, the vidangeur system created other objections. It was expensive, costing the city around \$20,000 annually to maintain. [128] And it increased the odor problem. In 1883 an anonymous letter writer complained in the Times that Shreveport needed a sewerage system "as bad as any town in America." "How few of our citizens," he exclaimed, "keep their boxes inclosed, and have air pipes leading above the roofs to carry off the stench from below!" He complained of the "foul odors" from the open boxes which "poisons the lower strata of our still summer air." Noting that newcomers to the city complained of the "peculiar foul air" they encountered on entering the city, he urged the city to seek bids on both a water and a sewerage system. [129] Thus both the cost and the offensive nature of the vidangeur system may have convinced Shreveport's city fathers of the advantages of water borne waste disposal.

The decision to seek not only water supplies but sewage disposal on the franchise system may also have been an effort to make the invitation for bids and the franchise more attractive to prospective contractors and to avoid the withdrawals that had invalidated the Kennedy and Perkins franchises.

At an informal meeting of the Council held at Mayor Currie's office on April 5, 1886, the Council, perhaps recognizing that it was not qualified to write up precise specifications for water and sewerage systems, and perhaps desiring to avoid the problems that had plagued their past attempts to attract private contractors, agreed to authorize Mayor Currie to spend \$500 to secure the services of a qualified engineer. [130] The appropriate resolution was passed at the April 8, 1886, meeting. [131]

Currie hired Major W.R. Coats of Kalamazoo, Michigan, an experienced water works engineer, who had designed or supervised construction of water systems in several midwestern cities. [132] Coats submitted plans and specifications to the Council on April 21. These plans included a map which indicated the exact routes the water and sewer mains were to follow and the location of every fire hydrant. [133]

With Coats' specifications the city formulated a detailed advertisement for bids, but with a difference. Previous advertisements had been largely open ended, that is, bidders were allowed wide limits in prescribing their specific remedy for the city's water ills. The result, judging from the frequency with which contractors withdrew from initial bids or contracts with the city in the period 1883-1886, was apparently irremedial disputes over specifics like the source of supply, the area to be covered by mains, the size of the mains, the location of the hydrants, the quality of the water, the cost of system extension, and so on. The specifications for the system written by Coats were precise, eliminating possible sources of misunderstanding and spelling out what the city required in detail, thus insuring an adequate system and uniform and comparable offers from bidders.

Water was to be taken from Cross Bayou near Arsenal Hill in deep water, pumped into two settling basins, and then filtered. Each settling basin was to have a capacity of 1 million gallons and be 20 feet deep when full. The pumping plant was to have a capacity of 2 mgd. The length, size, and routes of the water and sewer mains to be laid in the city were specified. There were to be 106 fire hydrants and a reservoir of at least 250,000 gallons capacity. The system was to be able to provide a pressure of at least 50 pounds per square inch to mains on the level of Commerce Street and be sufficient to drive six fire streams 100 feet high through 1-inch nozzles. The sewerage system was to be provided with outflow into the Red River and automatic flush tanks at the head of each line of mains or laterals. The city offered to pay annually 7% of the cost of extensions ordered on either the water or sewerage systems. Flat rates were specified for private consumers. The city included in the franchise offer the usual free water provisions and promised exclusive rights to the successful water and sewerage company for thirty years. At the end of this period the purchase price of the system was to be set by a three man board of appraisers -- one appointed by the city, one by the company, and the third appointed by the first two appointees. Contractors or engineers wishing to bid (i.e., specify the rates they would charge the city for hydrant and sewer rental after building the system) were asked to post \$2500 bond. [134]

It was very unusual for any city in the nineteenth century to simultaneously install a sewer and a water system. It was even more novel for a city to use the franchise system to secure a sewerage system (though not surprising considering Shreveport's financial condition). [135] Perhaps for these reasons Shreveport's new advertisement for bids was featured in Engineering News and thus given national attention. [136] Bids were opened on July 8, 1886. [137] There were again three bidders; two were minor firms, the third (Bullock) a major one. Their offers were:

Samuel R. Bullock & Co., New York	\$8800	for annual hydrant and sewerage rental
S.O. Brown	\$9600	" "
J.R. Williams	\$8876	" "

(posted no bond)

The low bid for hydrant (\$5800) and sewerage (\$3000) rental was entered by Samuel R. Bullock & Co., a company with experience in the water works field. Bullock had constructed plants for Sharon and Corry, Pennsylvania; Greencastle and Vincennes, Indiana; Pensacola, Florida; and Denison, Texas. [138]

On August 12, 1886, after consulting with Bullock, the Shreveport City Council passed the necessary franchise ordinance, an ordinance which differed only slightly from the ordinance suggested by Coats. [139] By early September Bullock had formally accepted the franchise, [140] but he had it amended in October to give him the right to form a separate corporation to construct and operate the Shreveport water system. [141] On October 19, 1886, taking advantage of the amendment, Bullock assigned the plant to the Shreveport Water Works Company. [142] The Bullock franchise required work on the system to begin within sixty days and be completed within a year. Bullock started on time and had finished construction of a pumping station at the end of McNeil Street, a water distribution system, and a sewerage system by late July 1887, a half month ahead of schedule. Shreveport, at last, had a general water supply system.

Chapter I: Notes

1. The standard works on the history of Shreveport are Viola Carruth, Caddo 1,000: A History of the Shreveport Area from the Time of the Caddo Indians to the 1970's (Shreveport, Louisiana, 1970); Maude Hearn O'Pry, Chronicles of Shreveport (Shreveport, 1928); Mary Lila McLure and J. Ed Howe, History of Shreveport and Shreveport Builders, 2 vols. (Shreveport, 1937); and S.A. Caldwell, "The Economic Development of the Shreveport Trade Area," Louisiana Business Bulletin, v. 5 (May 1943).
2. Chester & Fleming (hydraulic and sanitary engineers), "Report on Water Supply for City of Shreveport, Louisiana," March 1919, p. 14; A. Adler Hirsch, "Salinity Investigations and Recommendations for the Middle Reaches of the Red River," manuscript of paper presented at the 15th South-west Regional Meeting of the American Chemical Society, Baton Rouge, Louisiana, December 5, 1959; and Louisiana, State Board of Health, Biennial Report, 1910-1911, pt. 3, p. 114, and 1912-13, pt. 3, p. 187.
3. A.C. Veatch, Geology and Underground Water Resources of Northern Louisiana and Southern Arkansas (Washington, DC., 1906) [USGS Professional Paper no. 46] pp. 131-132.
4. Joel A. Tarr, "The Evolution of Wastewater Technology and the Development of State Regulation: A Retrospective Analysis," pp. 12-13, in Joel A. Tarr, ed., Retrospective Technological Assessment - 1976 (San Francisco, 1977); Nelson M. Blake, Water for the Cities: A History of the Urban Water Supply Problem in the United States (Syracuse, New York, 1956) pp. 14, 177; and George W. Fuller, "Historic Review of the Development of Sanitary Engineering in the United States During the Past One Hundred and Fifty Years: Water-Works," American Society of Civil Engineers, Transactions, v. 92 (1928) pp. 1273-1274 (comment of Caleb Mills Saville).
5. Daily Standard, September 29, 1880, mentions a tub cistern of this size.
NOTE: All newspapers are Shreveport newspapers unless otherwise specified.
6. Sanborn Map and Publishing Co., [Insurance Maps of] Shreveport, Louisiana, August 1885, indicate a number of subterranean cisterns in the city, but far more surface or tub cisterns.
7. Fuller, "Water-Works," p. 1274 (comment of Calib Saville). Filters for purifying water are advertised in the Times, September 11, 1894.
8. Carrut, Caddo 1,000, pp. 91-92.
9. Daily Standard, September 29, 1880, reports the explosion of one such cistern.
10. For instance, Daily Standard, December 6, 1879, reported an attempted suicide in a backyard subterranean water cistern, while the issue of October 14, 1881, reported that a lost mare had been found in an underground cistern.
11. South-Western, March 8, 1871.

12. Comment by "Fair Facts" in a letter to the editor of the Times, May 18, 1883.
13. Blake, Water for the Cities, p. 177.
14. Carruth, Caddo 1,000, pp. 91-92, mentions the use of Currie's spring; Shreveport City Council, Minutes, April 30, 1849, refers to the use of Howell's springs. The minutes of the Shreveport City Council are on microfilm at the Archives of Louisiana State University in Shreveport and are indexed. Technically, the minutes are of the Board of Trustees (1839-1871); the Board of Administrators (1871-1878) and the City Council (1878-Present), but since they are microfilmed as one series I will refer in reference notes uniformly to the Shreveport City Council, Minutes, even when, strictly, they were the Minutes of the Shreveport Board of Trustees or Board of Administrators.
15. South-Western, March 8, 1871; Carruth, Caddo, 1000, p. 92.
16. These conditions are implied by the wording of the city's first sanitary ordinances, passed in 1849. For these see William Wood, comp., The Charter, Ordinances, Police Regulations, and Laws of the Corporation of the Town of Shreveport in force on the 20th Day of July, A.D. 1849 (Shreveport, 1849) pp. 43-51.
17. South-Western, March 8, 1871. The information on the lack of public bathing houses is found in a letter printed in this issue from a "Fireman".
18. See, for example, Tarr, "Evolution of Wastewater Technology," p. 168.
19. Wood, Charter, Ordinances, and Laws, pp. 43-51.
20. Shreveport City Council, Minutes, June 7, 1847. By December the Committee on Artesian Wells reported progress and was asked to pursue the matter further (Minutes, December 7, 1847).
21. James C. Gardner, "The History of the Municipal Government of Shreveport: A Review," North Louisiana Historical Association, Journal, v. 1, no. 4 (1970) p. 1; Wood, Charter, Ordinances, and Laws, pp. 1-8.
22. Blake, Water for the Cities, p. 119, for example.
23. Veatch, Geology, pp. 82, 204-207, 287.
24. Shreveport City Council, Minutes, April 22, 1848 (terms); December 5, 1849 (location of well); March 19, 1850 (evidence that Alfred had bored around 100 feet).
25. Ibid., March 19, 1850.
26. Ibid., April 30, 1849.
27. Ibid., July 6, 1850.

28. Ibid., September 3, 1850.
29. Blaine A. Brownell and David R. Goldfield, eds., The City in Southern History: The Growth of Urban Civilization in the South (Port Washington, New York, and London, 1977) p. 68.
30. R.L. Shruggs, "Typhoid Fever, with some account of its prevalence in Western Louisiana this Year," New Orleans Medical and Surgical Journal, v. 7 (1850-1851) p. 488, cited by John Duffy, ed., The Rudolph Matas History of Medicine in Louisiana, v. 2 (Baton Rouge, 1962) pp. 22-23.
31. Duffy, Medicine in Louisiana, v. 1, p. 407; v. 2, pp. 169, 171-183; Blake, Water for the Cities, pp. 8-11 and elsewhere.
32. Blake, Water for the Cities, pp. 17, 20f, 46, 69f. Yellow fever also played a major role in the emergence of interest in a public water supply system in New Orleans (Duffy, Medicine in Louisiana, v. 2, pp. 171-172, 177, 452-453).
33. For the divergent approaches of the contagionists (quarantine school) and anti-contagionists (miasmatic school) see Blake, Water for the Cities, pp. 5-8, and Duffy, Medicine in Louisiana, v. 2, pp. 169, 174-176. Practically every history of medicine reviews this controversy. On the neglect of sanitary precautions after the passage of an epidemic see Duffy, Medicine in Louisiana, v. 2, p. 193, and Tarr, "Evolution of Wastewater Technology," p. 168, for example.
34. For example, Morrison & Fourmy's General Directory of the City of Shreveport for 1882-1883 (Houston, Texas, 1882) p. 16, notes, in referring to the 1873 yellow fever epidemic, "the miserable sanitary conditions of the city, which seems to have been totally neglected." Also, the Howard Association, Report of the Committee on the Yellow Fever Epidemic of 1873 at Shreveport, Louisiana (Shreveport, 1874) p. 7, commented on the general neglect of police regulations and sanitary precautions as a condition which "has always existed."
35. Times, September 30, 1873. See also Times, September 2, 1873; Waldo's Directory of Shreveport, La., 1881 (Shreveport, [1881]) p. 56; and R.J. Micciotto, "Shreveport's First Major Health Crisis: The Yellow Fever Epidemic of 1873," Northern Louisiana Historical Association Journal, v. 4 (1973) pp. 111-118.
36. Blake, Water for the Cities, pp. 17, 20f, 46, 69f, 131, 225-228, and elsewhere.
37. Shreveport City Council, Minutes, August 3, 1860, and July 3, 1866 (also South-Western, July 11, 1866).
38. Shreveport City Council, Minutes, June 17, 1873.

39. According to Brownell and Goldfield's The City in Southern History, p. 73, the two most common crimes in the antebellum South were arson and burglary.
40. For instance, Blake, Water for the Cities, pp. 5, 120, 141, 172, 204, 266, and elsewhere.
41. South-Western, October 4, 1854.
42. Brownell and Goldfield, City in Southern History, pp. 74-75.
43. Shreveport City Council, Minutes, November 12, 1866.
44. Ibid., February 5 and February 14, 1867.
45. South-Western, February 27, 1867.
46. Shreveport City Council, Minutes, May 20, 1867.
47. Ibid., June 4, 1867.
48. Ibid., February 5, 1868 (see also December 4 and December 10, 1867).
49. Ibid., May 5, 1868.
50. Ibid., June 3, 1869.
51. Ibid., September 7, 1869 (see also August 3, 1869).
52. Ibid., March 27, 1870; South-Western, May 11, 1870.
53. Shreveport City Council, Minutes, December 12, 1871.
54. Ibid., September 10, 1872.
55. Ibid., October 10, 1876.
56. Ibid., December 27, 1877.
57. I was able to locate a total of six fire cisterns on the Sanborn insurance maps of Shreveport of August 1885. See also Shreveport City Council, Minutes, October 10, 1876.
58. Shreveport City Council, Minutes, April 8, 1873.
59. Brownell and Goldfield, City in Southern History, pp. 70, 111; Blake, Water for the Cities, p. 77. Other cities also used fire cisterns, for example, Malden, Massachusetts, and Hartford, Connecticut (Fuller, "Water-Works," p. 1274 [comment of Caleb Saville]).
60. South-Western, March 8, 1871 (letter from a "Fireman").

61. Shreveport City Council, Minutes, December 27, 1877.
62. Sanborn, Insurance Maps of Shreveport, August 1885, cover sheet.
63. Brownell and Goldfield, City in Southern History, p. 110.
64. Ibid.
65. Official Journal of the Proceedings of the Constitutional Convention of the State of Louisiana, Held in New Orleans . . . (New Orleans, 1879) appendix ("Report of Committee on Public Debt").
66. Joe Gray Taylor, Louisiana Reconstructed, 1863-1877 (Baton Rouge, 1974) p. 205. The Caddo Parish delegates at the Louisiana Constitutional Convention in 1879 complained of "exorbitant municipal taxes" and reported that "we are a tax-ridden people" (see: Official Journal, appendix, "Report of Committee on Public Debt").
67. Brownell and Goldfield, City in Southern History, pp. 81, 96, 107.
68. Fuller, "Water-Works," p. 1209.
69. South-Western, February 15 and March 8, 1871.
70. South-Western, March 8, 1871 (letter from a "Fireman").
71. South-Western, February 15, 1871.
72. Shreveport City Council, Minutes, June 19, 1872, reprints a letter from the Board of Trade to the city's Board of Administrators informing it of the resolution.
73. For the story of Shreveport's problems with railroad bonds in the 1870s see Tom Ruffin, "Debt Swamp and How a City Recovered," Shreveport Magazine, v. 28 (March 1973) pp. 20-21, 37-40.
74. Ruffin, "Early Railroading in the Ark-La-Tex," Shreveport Magazine, v. 25 (February 1970) p. 46.
75. For biographical data on Andrew Currie see Biographical and Historical Memoirs of Northwest Louisiana (Nashville, Tennessee, and Chicago, 1890) pp. 60-66, and McLure and Howe, History of Shreveport, p. 257.
76. Shreveport City Council, Minutes, March 6, 1884.
77. Daily Standard, May 18, 1880.
78. Daily Standard, August 30, 1881.
79. Daily Standard, September 2 and September 14, 1881.
80. Biographical and Historical Memoirs of Northwest Louisiana, p. 60.

81. Times, December 15, 1885. Fire protection may have taken precedence over other uses of water as a stimulus for the development of water systems in other Louisiana cities as well in this period: see, Donald J. Miller, "Town Development in Southwest Louisiana, 1865-1900," Louisiana History, v. 13 (1972) p. 146. Caleb Saville claimed that the great Chicago and Boston fires of the 1870s provided a stimulus to water works construction all over the country in Fuller, "Water-Works," p. 1273.
82. Shreveport City Council, Minutes, February 1, 1883.
83. Ibid., May 3, 1883.
84. Times, May 5, 1883, and a number of subsequent issues, e.g., May 29, May 30, June 1, June 2, and June 6, contain the two proposed franchise agreements.
85. Times, May 11, 1883 (editorial) and May 18, 1883 (letter from "Fair Facts").
86. Shreveport City Council, Minutes, May 3, 1883.
87. This was pointed out in a letter from a "Tax Payer" to the Times, May 12, 1883. See also Ruffin, "Debt Swamp," p. 40, on the reluctance of the city to again go into debt.
88. See the Louisiana Constitution of 1879, art. 209, 242, and William Ivy Hair, Bourbonism and Agrarian Protest: Louisiana Politics, 1877-1900 (Baton Rouge, 1965) p. 101.
89. Shreveport City Council, Minutes, July 14, 1884; Times, June 18, 1884.
90. "Sewerage by Franchise," Engineering Record, v. 21 (1890) p. 273. It is clear from the background and context of the discussion of sewerage by franchise that it is Shreveport which is being described, although in the description itself Shreveport is not specifically mentioned. See in this connection: "Towns Sewered on the Franchise Plan," Engineering Record, v. 21 (1890) p. 267, and "Sewerage and Water Supply Franchise of Shreveport, La.," Engineering Record, v. 21 (1890) pp. 281-282.
91. Blake, Water for the Cities, pp. 45, 63.
92. In 1880 there were 598 water works in the United States; in 1890 there were 1878: M.N. Baker, ed., The Manual of American Water-Works, 1891 (New York, 1892) p. x. See also Tarr, "Evolution of Wastewater Technology," pp. 168-169, on the influence of urban growth on the development of water and sewerage systems.
93. Fuller, "Water-Works," p. 1286 (comment of W. Kiersted), and H.G.H. Tarr, "More Than Fifty Years' Reminiscence in Waterworks," American Water Works Association, Proceedings, 1912, pp. 52-53.

94. Baker, Manual, 1891, p. xxxv.
95. Calculated from tables in Baker, ed., The Manual of American Water-Works, 1888 (New York, 1889) pp. xlv and lxxxiv.
96. Calculated from a table in Baker, Manual, 1891, p. xxxii.
97. According to Currie, addressing the City Council, Drake had constructed water works in several cities, notably Austin and Fort Worth, Texas (Shreveport City Council, Minutes, May 3, 1883). Baker, Manual, 1888, lists the contractor for the Austin works (1882 reconstruction) as M.C. Orton and for the Ft. Worth works as Drake & Orton of New York City (pp. 478, 482). Drake also built the water works of Grainesville, Texas (pp. 482-483).
98. Times, May 5, 1883, and a number of subsequent issues including May 29-31 and June 1-2, 1883.
99. Currie's remarks in the Minutes of the Shreveport City Council, May 3, 1883. I was unable to find any works erected by the "North American Construction Company" in the 1888 Manual of American Water-Works.
100. Times, May 5, 1883, and a number of subsequent issues including May 29-31 and June 1-2, 1883.
101. Times, May 5, 1883.
102. Times, May 11, 1883 (editorial); May 12, 1883 (letter from "A Taxpayer") and May 18, 1883 (letter from "Fair Facts").
103. Times, May 5, 1883.
104. Times, May 12, 1883 (letter from "A Taxpayer").
105. Ibid.
106. Shreveport City Council, Minutes, September 6, 1883.
107. Ibid., November 15, 1883.
108. Ibid., December 6, 1883.
109. Ibid., March 6, 1884.
110. Ibid.; Times, March 8, 1884.
111. Shreveport City Council, Minutes, April 4, 1884.
112. Ibid., June 12, 1884, and July 10, 1884.
113. Ibid., September 11, 1884.
114. P.J. Kennedy is not listed as an engineer or contractor in Baker's 1888 Manual of American Water-Works for any water system in the United States or Canada.

115. Shreveport City Council, Mintues, December 10, 1885.
116. Ibid., September 10, 1885.
117. Ibid., November 12, 1885.
118. Baker, Manual, 1888, pp. 376, 417, 440, 463-466, 468, 473, for evidence of Perkins' construction activities. Perkins claimed, in a letter dated November 2, 1885, and copied in the Shreveport City Council, Minutes, December 11, 1885, that he had thirteen years' experience in the water works business, with no failures, and had systems in operation in fifteen cities.
119. Shreveport City Council, Minutes, November 12, 1885.
120. Ibid., December 10, 1885.
121. Ibid.
122. Ibid., December 11, 1885, for the text of the Perkins franchise, and also Times, December 13 and December 15, 1885.
123. Shreveport City Council, Minutes, January 21, 1886, contains a copy of Perkins' letter of acceptance of December 20, 1885.
124. Ibid., March 31, 1886.
125. M.N. Baker, The Quest for Pure Water: The History of Water Purification from the Earliest Records to the Twentieth Century (New York, 1949) pp. 183-188.
126. Shreveport City Council, Minutes, March 31, 1886.
127. S.C. Fullilove, comp., Ordinances (1839-1909) of the City of Shreveport, Louisiana (Shreveport, 1909) pp. 96-99, 103, 110-112.
128. Engineering News, v. 15 (1886) p. 392 (a short notice of Shreveport's advertisement for bids on a water and sewerage system).
129. Times, May 18, 1883 (letter by "Fair Facts").
130. Times, April 6, 1886.
131. Shreveport City Council, Minutes, April 8, 1886.
132. Baker, Manual, 1888, pp. 344, 361, 403.
133. Shreveport City Council, Minutes, April 21, 1886.
134. Ibid., May 13, 1886; "Shreveport Water-Works and Sewerage Specifications," Engineering News, v. 15 (1886) pp. 398-399.

135. "Towns Sewered on the Franchise Plan," Engineering Record, v. 21 (1890) p. 267. Engineering Record's editor noted: "The only place we know of that is sewered on the franchise plan in Shreveport, La." Correspondence in subsequent issues of Engineering Record revealed that there were a few other cities also sewered on a franchise plan, but these were mainly very small cities whose systems were built after Shreveport's. See also: "Sewerage by Franchise," Engineering Record, v. 21 (1890) p. 273, and "Sewerage and Water Supply Franchise of Shreveport, La.," Engineering Record, v. 21 (1890) pp. 281-282. Tarr, "Evolution of Wastewater Technology," p. 170, says that in the first three quarters of the nineteenth century no city simultaneously constructed a sewer system and water works.
136. Engineering News, v. 15 (1886) p. 392, and "Shreveport Water-works and Sewerage Specifications," Engineering News, v. 15 (1886) pp. 398-399.
137. Shreveport City Council, Minutes, July 8, 1886.
138. Baker, Manual, 1888, pp. 178, 223, 273, 331, 339, 481.
139. The text of the Bullock franchise ordinance can be found in Shreveport City Council, Minutes, July 9 and August 12, 1886; in Shreveport Water Works Company, "Schedule of Property and Data Prepared for the use of the Appraisal Board, February 1913," pp. 6-24; and "Sewerage and Water Supply Franchise of Shreveport, La.," Engineering Record, v. 21 (1890) pp. 281-282.
140. Shreveport City Council, Minutes, September 9, 1886.
141. Ibid., October 2, 1886.
142. Shreveport Water Works Company, "Schedule of Property and Data," p. 44 (in: "Chronological Record of the Shreveport Water Works Company").

CHAPTER II

DISPUTES AND COMPLAINTS:

The City and the Private Franchise, 1887-1911

In 1891 M.N. Baker, editor of the Manual of American Water-Works, observed:

the majority of our cities and towns have been so anxious to secure water, or what is worse, so careless and ignorant, that they have not properly protected their interests in granting franchises, having failed to retain for themselves a reasonable control over water rates, and the privilege of purchasing the works at a fair price whenever, within proper limits, they desire to do so. [1]

Baker believed that all franchise ordinances should include specified rates (or provisions for continuing municipal control over rates) and provisions for municipal purchase at a fair price, and that, in addition, franchises should be no longer than twenty years in duration. He found, however, that 63% of private water franchises had no rate regulation; 54% had no provisions for city purchase; and 60% were for periods of more than twenty years. [2]

Shreveport, perhaps due to the long struggle to secure a corporation willing to build a system and its eventual use of a trained water works engineer (Coates) to draw up the specifications for the system, avoided most of these problems. The franchise granted to Samuel R. Bullock & Co. in 1886 set maximum water rates and contained provisions for purchase of the plant at the expiration of the franchise at a fair price (to be set by a board of appraisers). The franchise length granted Bullock -- thirty years -- was somewhat longer than recommended by Baker, but not drastically longer. [3] In addition, the franchise agreement contained numerous other provisions designed to protect the city. For instance, the pumping capacity of the plant required by the Bullock ordinance was greater than the 100 gallons per capita per day recommended by experts. [4] And the franchise ordinance stated clearly the terms and condition of plant enlargement, another element recommended by experts in the field. [5]

The franchise agent, Samuel R. Bullock & Co., moreover, was an experienced contractor in the water works field. By 1888, besides the Shreveport plant, Bullock had secured franchises and erected water systems in Chester, Corry, and Sharon, Pennsylvania; in Circleville, Defiance, Marion, and Massillon, Ohio; in Greencastle, Jeffersonville, and Vincennes, Indiana; as well as Pensacola, Florida; Paducah, Kentucky; Vicksburg, Mississippi; Denison, Texas; and Stevens Point, Wisconsin. [6]

The engineer assigned by Bullock to design the Shreveport plant was E.F. Fuller. Fuller, too, was experienced, having designed a half dozen works for Bullock, in addition to supervising extensive reservoir repairs at the Knoxville, Tennessee, water works in the early 1880s. [7]

With an adequate franchise agreement and an experienced contractor, it would seem that the city of Shreveport's venture into the general water supply field was off to a propitious start. Even more encouraging were Bullock's construction activities. By late July of 1887, several weeks ahead of schedule, he had completed Shreveport's water supply system and had it ready for testing. [8]

THE MCNEIL STREET STATION IN 1887

Shreveport's water works were the second in Louisiana, preceded only by the much older New Orleans works (constructed 1833-1840). [9] The heart of the works was the pumping station located at the end of McNeil Street near Arsenal Hill on Cross Bayou. The location was excellent. It was one of the highest areas near the city, was near the congested downtown district, and was, of course, adjacent to the water supply stipulated in the franchise ordinance (Cross Bayou).

The pumping station which Fuller designed for Shreveport was in the shape of the letter "L", one wing pointing north, the other east. The apex, or central portion, of the "L" was a 29 by 32 foot boiler room with a brick floor and two Alderorth and Root boilers. Adjacent to it on the west was a square smoke stack. The north leg of the "L" was a 30 by 36 foot wood-floored low service pump room. This room contained a pump pit around 13 feet in diameter by 45 feet deep and two Blake, single expansion, vertical steam pumps of 1 mgd (million gallons per day) capacity. These pumps sucked water from a timber crib in Cross Bayou through a suction pipe laid in a wood tunnel, and then forced it into the settling basins. The eastern leg of the "L" was a 32 by 34 foot wood-floored high service pump room. [10] This room housed two horizontal, compound, condensing Blake steam pumps which took water from the settling basins and pumped it into the mains leading into the city. (See HAER photo LA-2-3 and drawing sheets 1-3 of 10) The make of pumps installed was not unusual. Blake in the late 1880s was the fourth leading manufacturer of pumping engines in the United States with around 7 to 8% of total installed pumping capacity, well behind Worthington and Holly-Gaskill, the two leading manufacturers, but still quite respectable. [11]

The two sedimentation or settling basins, located a few feet south or behind the McNeil Street Pumping Station, were well placed for gravity flow into the pump station building. Each of these basins held $2\frac{1}{2}$ to $2\frac{1}{2}$ million gallons of water and was around 110 feet wide by 180 feet long (at the top), with a depth of 23.4 feet. A wall 13.5 feet wide separated the two basins, and four wooden baffles in each broke up and slowed down the flow of water. The walls of the basins were sloped -- the inside walls at 1.5 to 1. The divider wall was sloped 1 to 1 on the east side, 2 to 1 on the west. The bottoms of the basins were flat, covered with brick laid on edge in a concrete base which rested on clay puddle. The walls of the basins may

have been poorly designed or poorly constructed. In 1919 J.N. Chester, an engineer with wide experience in the water works field, noted that due to the abrupt slopes used, the basins were "a constant source of expense and a menace to the reliability of the filter plant." [12] (See HAER photos LA-2-73 to LA-2-75 for views of the settling basins c1912) The flat bottoms indicate the McNeil basins were initially designed primarily for natural sedimentation. They provided inadequate drainage and cleaning facilities for use with chemical coagulants. Table 4 is a plan of the McNeil plant in 1899. It indicates the location of the settling basins (the offset filter wing shown on the plan was added to the plant in 1890).

The water distribution system in 1887 consisted of 8.5 miles of mains and 106 hydrants. Most of the mains and hydrants were placed in or near the congested downtown district of Shreveport. The system also had a standpipe. Erected on one of the highest spots in the city, near the junction of Texas and Hope streets, adjacent to the old "Charity Hospital" (site of the present City Hall), it was 20 feet in diameter, 110 feet high, and had a storage capacity of 250,000 gallons. (See HAER photo LA-2-103) This was inadequate for a storage reservoir, since, at best, it could have provided only a few hours supply. The standpipe's main function was to equalize pressure in the system. It removed from the distribution system pulsations due to the action of the high service steam pumps and permitted the reciprocating steam pumps to operate at full stroke at all times. Finally, it also provided a safety factor in case of fire.

Direct pressure systems supplemented by standpipes were common in the 1880s. Approximately 18% of all water works in 1888 used a distribution system of this type, and 26% of the works in the South. [13] Only pure gravity systems and direct pressure systems supplemented by reservoirs were more popular. But the absence of substantial elevated areas in the vicinity of Shreveport ruled these options out.

Shreveport's system was completely unmetered when completed in 1887. This also was common at the time. The Manual of American Water-Works of 1891 noted that meters were "seldom" installed with water works, [14] and the 1888 Manual noted that nearly 1600 of 1700 water works in the United States had "few or none in use" [15]. The neglect of metering was due to several causes. Franchise owners were reluctant to install meters, since they represented an additional expense. Consumers resisted metering if they were expected to purchase and maintain the instruments. And, in some circles, there was a strong prejudice against restrictions on the use of water, due to fear that restrictions would result in the neglect of personal cleanliness by the poor to the detriment of public health. [16]

The Shreveport system was completed, as already noted, in late July 1887, a half month ahead of schedule. It was tested on July 28 to the "full and complete satisfaction of the Mayor and Councilmen of the City of Shreveport." On the 29th the Council formally accepted Bullock's work and his assignment of the plant to the Shreveport Water Works Company, incorporated in New York state. [17] Bullock served as President of the company; John B. Crawley, Fuller's assistant engineer during construction, was eventually made local superintendent. [18]

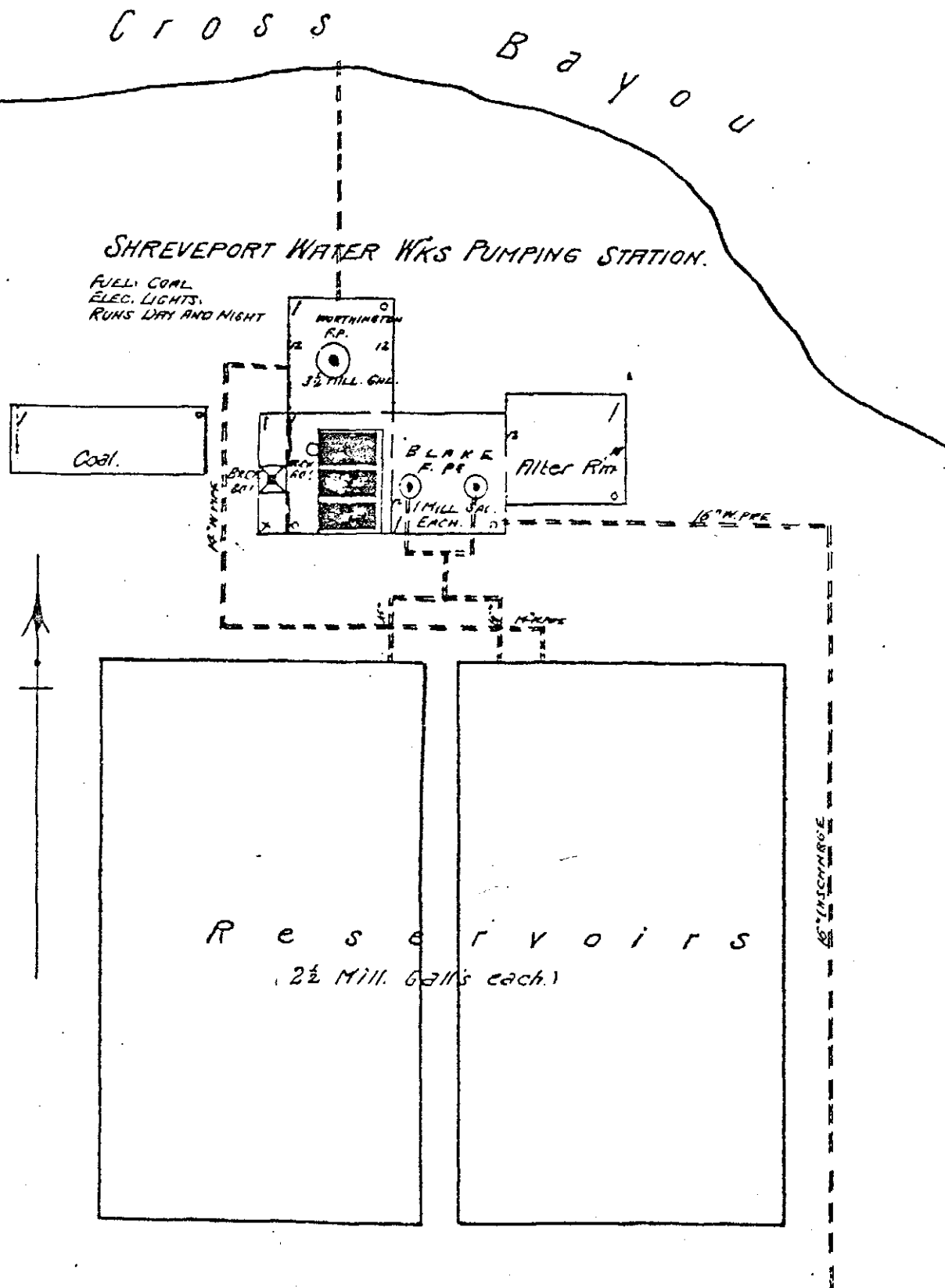


Table 4: Plan of the McNeil Street Pumping Station of the Shreveport Water Works Company, 1899 (from Sanborn Insurance Maps of Shreveport)

Despite the encouraging beginnings of Shreveport's venture into a privately franchised general water supply system, problems soon emerged. Samuel R. Bullock & Co. operated the Shreveport works for only two years, and they were not happy ones. Relations between the franchise holder and the city deteriorated quickly. For instance, the system had not been operating a year when C.A. Leffinwell, owner of the city's first electric lighting plant, asked the Council to sue the Shreveport Water Works Company, blaming it for the loss of his plant by fire. [19]

In February 1889, after numerous complaints from citizens over the muddy character of the water being supplied by the system and several fires at which the water pressure was poor, the Council voted to disallow a bill of \$2200 owed the Shreveport Water Works Company. In the resolution which authorized withholding payment, the Council charged Bullock's company with failing to comply with its contract "in many particulars" and pumping into the mains water that was so muddy that it was "not fit for even hathing purposes." The Council also observed that the system's fire pressure had been inadequate, throwing streams less than 50 feet high at recent fires, instead of the 100 feet guaranteed. [20]

Bullock in March 1889 decided to install a filter plant at McNeill after both the city and a number of private customers refused to pay their bills. [21] In April the City Council was informed of this decision and assured that filters would be operable by January 1, 1890. The Council was told by Bullock that the filters were being installed only because the city had agreed to enforce the ordinance it had passed in 1887 requiring property owners within 320 feet of sewer lines to make connections and to pay its hydrant rentals promptly. The Council, however, refused to accept any conditions on Bullock's installation of the filter plant, arguing that the water system had never been "properly completed" and was, in fact, "defective in a number of features adroitly concealed from the public, and the accepting authorities, hut gradually coming to light." [22]

Discontent with the system was reflected not only by the acrimonious charges made by the Council against the franchise holder, but also by consumer statistics. In 1887 the Shreveport water system had 434 taps (or customers); this figure had declined to 382 by 1889. [23]

Engineering News reported on July 13, 1889, that the Shreveport water works had been purchased by the First National Bank of New York City. [24] Although the 1891 edition of the Manual of American Water-Works contradicted this announcement, [25] it seems clear that the works did change hands, for Engineering Record reported in 1890:

We helieve in that case [Shreveport] the water-works and sewers were put in hy a contractor who subsequently failed, and the hondholders took both works and are now running them. [26]

Probably the First National Bank of New York had purchased the bonds issued by Bullock to finance construction of the Shreveport system and assumed control of the works in 1889, not through purchase, hut through foreclosure when Bullock & Co. failed. [27]

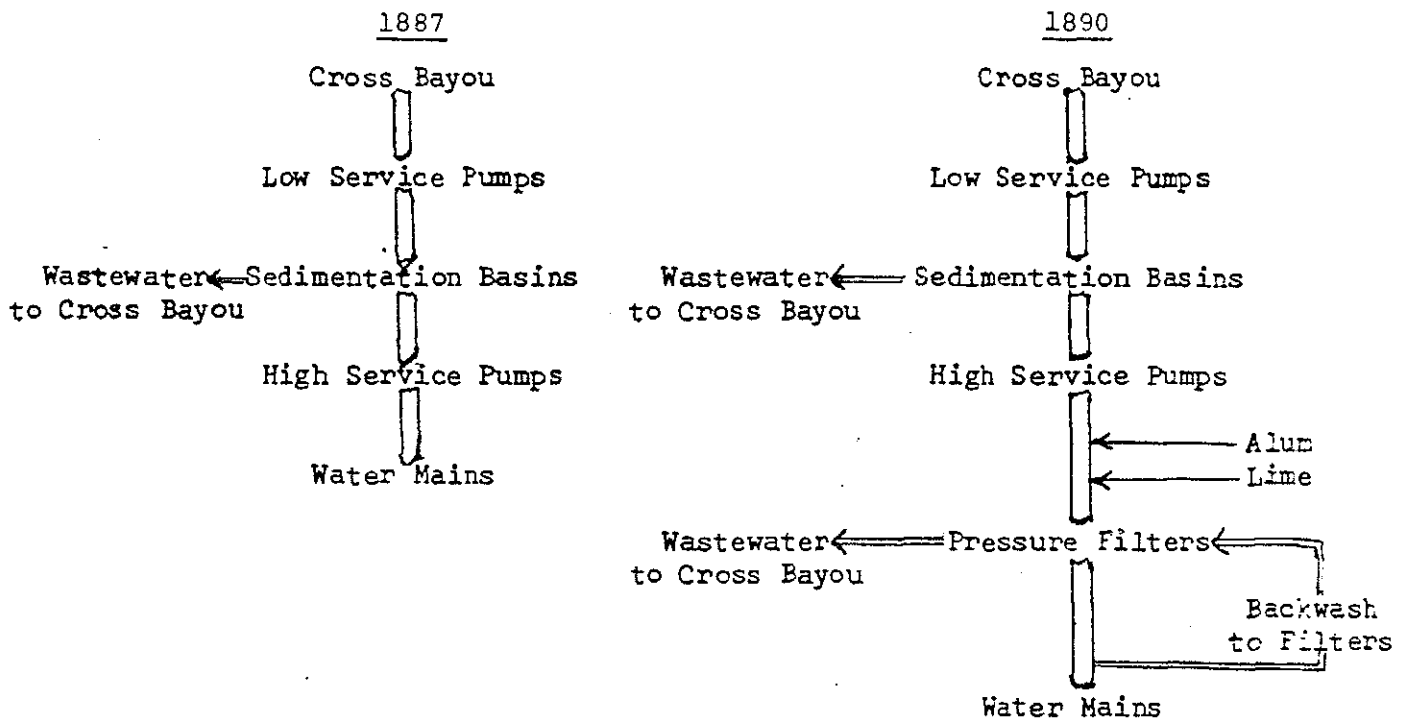
The new owners of the system completed installation of the filters. An offset filter room, around 32 feet by 37 feet, was added to the eastern end of the high service pump room (see Table 4). Four 250,000 gpd upward flow Hyatt pressure filters were installed there. McNeil's Hyatt filters were vertical steel cylinders 10 feet in diameter by 8 feet tall. Each contained 6 feet of sand supported on a perforated false bottom. (See HAER photo LA-2-4 for the pumping station with the 1890 offset filter house and HAER photo LA-2-60 for the Hyatt pressure filters installed in that room in 1890)

The addition of filters altered the flow of water through the station (see Table 5). Water continued to be drawn from Cross Bayou and pumped into the settling basins by the low service pumps. Water also continued to be drawn from these basins by the high service pumps. The new filters, however, were situated in the force main, between the high service pumps and the general water distribution system. In the portion of the line between the high service pumps and the filters lime and alum were injected into the water by diaphragm pumps. The lime was used to soften the water, the alum to speed coagulation and the formation of the gelatinous coatings on the filter sand which made rapid sand filtering effective. [28]

Shreveport's Hyatt pressure filters were well adapted for conditions at McNeil. The older slow sand filters (in use in water works since 1829) were much more expensive and had proven inadequate for water with high turbidity, like the surface waters around Shreveport. Mechanical or rapid sand filters, of the pressure or gravity variety, used in conjunction with coagulants, had been introduced only around 1884, but had already established a modest reputation for being able to deal with high turbidity. [29] Although later experiments were to demonstrate that pressure filters, in particular, were not as effective in removing bacteria as either gravity rapid sand filters or slow sand filters, they offered other advantages. They were cheap, economical with floor space, and could be installed quickly. [30] All of these factors probably appealed to a franchise owner compelled to install a filter system against his wishes, since they kept first costs low.

There are several other indications that keeping first costs low was a central object in the design of the city's first water purification system. For instance, McNeil was provided with no clear water well to provide a reserve of filtered water for emergency pumping needs (e.g., a major fire or peak loading). Instead, the plumbing at McNeil was equipped with valves so that the filters could be bypassed and raw water pumped into the system in emergencies. Residues of the unfiltered water would, of course, remain in the system for some time afterwards. It is true that for normal operation pressure filters did not need clear water wells, since rate of filtration was dictated by rate of pumpage. But for optimum service it was advisable to have one. Another element missing in the filtration system at McNeil in 1890 was a wash water tank to provide water for backwashing the filters. Instead, water already pumped into the mains had to be drawn back through the filters, decreasing pressure in the mains and increasing pumping costs. The filtration system installed at McNeil in 1890 was clearly a system designed with low capital investment rather than optimum service in mind. But it was quite typical of municipal water filtration systems c1890. [31]

Table 5: Flow Diagram: The McNeil Street Station in 1887 & 1890.



Nonetheless, Shreveport was fortunate in many respects to have filtered water at all. In 1890 when McNeil's filters were put into service only 1.44% of the nation's population were being served filtered water. [32] Of the nation's 1883 water works, only 187 were equipped with filters, and only twelve of these works were in the South. Moreover, many of the 187 filtered supplies depended on crude filtration galleries. Only fifty used mechanical (i.e., rapid sand) filtration like Shreveport's system. But of these fifty, thirty used Hyatt filters. [33]

One of the major shortcomings of pressure filters was poor bacterial efficiency, but this was not a primary consideration in 1890 (and was, in fact, not recognized yet). Filters were initially introduced in Shreveport, as in many other cities, not for their sanitary benefits, but because they improved the aesthetic qualities of the water -- its taste, color, and odor. Bacterial efficiency did not become a major factor in the selection of filter plants until almost 1900. [34]

Initial reaction to the performance of the filters in clearing up taste, color, and odor in Shreveport's waters was favorable. The Daily Caucasian noted shortly after the filters were installed that there had been a "very perceptible" improvement in water color and quality. [35]

But despite the new filtration equipment and new ownership, relations between the franchise holder and the city soon continued on their downward course. In August of 1891, apparently as the result of water pressure problems at a fire, the City Council appointed a committee to investigate the water works, and the Shreveport Times urged the Council to compel the company to put all of its apparatus in "at least reasonable safe working order," noting: "We doubt if they are in the spirit of the law and the charter." [36]

In response to these charges John B. Crawley, superintendent of the plant, informed the committee that his pumps had been working poorly for a week before the fire and that he had telegraphed for an expert from the Worthington Pump Company to investigate. They found that the problem was due to a fisherman's "bag" [sic, barge?] which had lodged against the screen of the intake and damaged it. On further investigation, the Council's committee confirmed that repairs to the intake crib were, indeed, being made, but they also found that the boilers in the plant were "in very bad condition, and liable to give way at any time." The committee asked the Council to demand that a new set be installed immediately. [37]

Complaints against service from McNeil came not merely from the City Council and individual citizens. The Shreveport Board of Underwriters in November of 1891, perhaps in justification for continued high fire insurance rates in the city, charged that the system's water pressure had been inadequate for some time past and was "totally inadequate" for extinguishing fires. [38] And the Fire Department in January 1892 noted that hydrants were not being kept in first class condition by the water company. [39]

One of the local papers, the Progress, was particularly strident in its criticism. In May of 1892 it charged that company water was still too muddy for bathing most of the year, and it complained that it was tired of bearing the water company reply to complaints with the bland assertion: "Men are now

employed to repair the breakage." The repairs were, somehow, never satisfactorily done. [40] In May and June 1892 the Progress urged patrons of the water system to sue for their rights in the courts. Crawley, the system's superintendent, was charged with treating "just demands" with "contempt" and with being "indifferent" to complaints about muddy water. [41] A few months later the Progress blamed the water company for the loss of the city's first electric light plant, a drug store, and a dry goods store and charged it with "openly and flagrantly violating its obligations" with "hrazenness and impudence." The company's superintendent, Crawley, was called "a fit representative of a soulless corporation," a man husy extracting bis "pound of flesh." [42]

In September of 1892, perhaps in reaction to the continued deterioration of city-franchise relations, the First National Bank sold the works. Crawley dropped by the Progress' office to personally inform tbe editor that he would hereafter have to "scold" someone else. [43]

The first five years of tbe Shreveport franchise (1887-1892) were clearly not good ones. The plant did not operate effectively, and, as a result, relations between the city and the water franchise got off to a poor start. Part of the blame may lie at the city's doorsteps. In order to make the franchise more lucrative and to secure better terms from the franchise agent (Bullock), the city had agreed to pass and had passed ordinances requiring anyone living within 320 feet of a sewer line to connect with it. The city may not have strictly enforced this ordinance after having passed it. [44]

On the other hand, the system installed by Bullock at McNeil in 1887 was clearly inadequate. There is an abundance of circumstantial evidence which suggests that Bullock built the Shreveport system with profit rather than service reliability in mind. In the first place, Bullock seems to have been engaged in the erection of water works purely as a speculative venture, intending to sell them at a profit as soon after completion as possible. This speculation is supported by data in the 1888 Manual of American Water-Works. This guide indicates that Bullock constructed sixteen plants in the period 1880-1888, but was still owner of only two in 1888. [45] Further supporting this conjecture is a veiled reference in Engineering Record which refers to the builder of Shreveport's sewerage system as "a purely speculative organization, which proposed to carry out its work by borrowing money elsewhere and giving liens on its anticipated revenues in payment, having no interests in the city except to make as much out of it as possible." [46]

The absence of a filter plant at McNeil in 1887 certainly suggests that Bullock was attempting to squeeze the maximum possible profit out of the Shreveport venture, even at the risk of contract violation. The franchise ordinance passed by the City Council and accepted by Bullock in August 1886 very clearly stated that Cross Bayou water was to be filtered. Yet, as noted, Bullock installed no filters at all in 1886-1887 and apparently had no intention of doing so. He only agreed to install them when the city began withholding payments on its bills. The city's charge that the works at McNeil had never been "properly completed" were thus well justified, although the Council should have detected the shortcoming before accepting the system.

The type of filter plant installed in 1889-1890 further suggests that the franchise was owned by a company interested in maximizing profits at the expense of performance, since, without a wash water tank or clear water well, it provided only minimum compliance with the franchise ordinance requirements.

Chester's comment on the settling basins (already noted) indicates that they may have been poorly designed or constructed. And there were deficiencies in the boiler plant. The two original Aberdroth and Root boilers, after only four years of service, were described as being "in very had condition, and liable to give way at any time." [47] In fact, they had to be replaced in 1892, [48] after only five years of service, instead of the more usual ten to twenty years. The boilers installed in 1887 were either inadequate in capacity (and hence worked above the safe limits), or very poor quality to begin with, or very poorly maintained.

The assumption that Bullock's design decisions at McNeil were dictated by the intention of keeping first costs low and selling quickly for a profit may also help explain the steam plant installed in 1887. As Table 6 below indicates, there were four basic types of steam pumping engines commonly used in water supply systems in the mid- to late 1880s. Generally, the choice of engine depended on the cost of fuel, the volume of water to be pumped, and whether the pump would be in service constantly or intermittently. In large water works, where the volume of water to be pumped was large, where the engine would be run a substantial portion of the day, and where fuel costs were high, the vertical, triple expansion, crank-and-flywheel engine was preferred. Its much higher first cost would soon be made up in fuel savings. For small water works, with very low fuel costs and intermittent operation of engines, the single expansion direct-acting steam pump was the best investment. Its higher fuel costs were not sufficient, during the life of the engine, to offset its very low first cost. [49]

Table 6: Duty and Approximate Cost of Steam Pumping Engines Commonly Found in Water Supply Systems c1886-1887

Single expansion, direct-acting steam pumps, without condensers
(vertical or horizontal) Duty: c40M Cost: c\$2000 per mgd
capacity

Compound, direct-acting steam pumps with condensers (usually hori-
zontal) Duty: c70M Cost: c\$2750 per mgd capacity

Compound, crank-and-flywheel pumps with condensers (vertical or
horizontal) Duty: c90-100M Cost: c\$4000 per mgd capacity

Triple expansion, vertical, crank-and-flywheel pumps with condensers
[or Worthington, horizontal, direct-acting pumps with high duty
attachments] Duty: c120M Cost: c\$5000 to \$10,000 per mgd capacity

Table based on: "The Relative Economy of High-Duty Pumping Engines,"
Engineering News, v. 28 (1892) p. 589, and Frank H. Pond, "Pumping Machinery
for Water Works," Engineering News, v. 13 (1885) p. 341.

Shreveport fell between these two extremes. It was a relatively small water works -- maximum pumping capacity 2 mgd. But fuel costs for Shreveport in 1886 were probably high since Shreveport was not located in close proximity to coal fields and the oil and natural gas which would be used as a fuel later had not been discovered and put to use. Had the city built the system, its engineers would probably have selected the direct-acting, compound engine, with condenser. It combined low initial costs with reasonably good fuel efficiency. It also had the advantage of low maintenance costs (direct-acting engines were mechanically simple), a factor of some importance in cities like Shreveport, some distance from the centers which manufactured steam engines and their replacement parts.

For high service Bullock installed the direct-acting, compound, condensing steam pump, a selection appropriate to Shreveport's circumstances. However, for low service Bullock installed practically the cheapest possible engines -- two vertical, single expansion (apparently non-condensing) units. These engines would have had high fuel costs. They were also either faulty to begin with, improperly installed, or poorly maintained, for there was a very high turnover in the low service pumping room during the first decade of the station's operation. [50] The two Blake vertical low service engines initially installed were used for less than five years. They were replaced in 1891 with a direct-acting, vertical Worthington pump of 3 mgd capacity. This engine also gave trouble and was replaced within a year or two by either one or two (surviving records differ) [51] Gordon compound, condensing steam pumps, which in turn was (were?) replaced in 1898 by a direct-acting, vertical, triple expansion Worthington condensing steam pump. Although the evidence is not decisive, Bullock's choice of engine for the low service room was quite likely made with the intention of keeping first cost as low as possible. Since Bullock probably planned to sell the system as soon as possible, he would not have had to worry about their high fuel costs, faulty construction, or faulty installation.

Although there may still be some room for reasonable doubt, the poor performance of the system in its early years, Bullock's reluctance to build a filter plant, the poor service record of the low service pumps, the boilers, and the settling basins, among other things, certainly leaves Bullock's performance as a franchise agent in a dim light. There is, in other words, considerable circumstantial evidence that Samuel R. Bullock & Co. was (in the words of Engineering Record) attempting to "make as much out of it [Shreveport] as possible."

THE FRANCHISE UNDER LOCAL OWNERSHIP (1892-1899)

In the fall of 1892 the Shreveport water franchise was purchased by Peter Youree of Shreveport, and his associates, the most prominent being J.P. Scott and M.P. and E.D. Hillyer of Topeka, Kansas. [52] They incorporated the Shreveport Water Works Company under Louisiana laws on October 11, 1892, with Peter Youree as President and M.P. Hillyer as General Manager. [53]

Captain Peter Youree (1843-1914) was a native of Missouri and a Confederate veteran. He had settled in Shreveport when discharged from the Confederate Army there in 1865 at the age of twenty-two. After some years

working as a clerk, he slowly built up a mercantile business of his own. He also established the city's first street car line. In 1888 he terminated his mercantile career and accepted the presidency of the Merchants and Farmers Bank, but later left it to become First Vice President of the Commercial National Bank. These activities did not leave Peter Youree with time for the day-to-day management of the water supply system he had purchased. He, therefore, invited his brother, Henry H. Youree (1857-1910), to migrate from Texas to Shreveport to take charge of the daily operation of the system as superintendent. [54]

The change of ownership in 1892 seemed to bode well for Shreveport's water supply. The new president of the company was a long time resident of Shreveport, concerned about her growth, and with experience in the public utilities field. And the new owner promised, on purchasing the plant, "extensive and radical changes" to improve "the efficiency of the service and give the city a larger and purer supply." [55]

In January of 1893, however, the City Council, overly cautious after the problems with Bullock, demanded bond from Peter Youree to insure fulfillment of the franchise contract in the future. But Youree, realizing that the city had no legal basis for demanding the bond, refused. [56] Whatever misgivings this might have created were defused when the Shreveport Water Works Company, under its new owners, kept water pressure up to contract for some months following the purchase. [57]

The Yourees also made some attempt to improve the McNeil plant. For instance, two 16 foot long by 66 inch wide Atlas water tube boilers, rated at 100 hp each, were purchased in 1892 to replace the defective 1887 boilers, and in 1893 a third boiler (from the Lookout Boiler Works, Chattanooga, Tennessee) was added. The Worthington vertical pump which had replaced the original Blake low service pumps in 1891 and which had proved defective, was replaced with one (possibly two) Gordon horizontal compound condensing pump, placed initially on an incline on the bank leading down to Cross Bayou. Also, in 1892 the Yourees erected a dam on Cross Bayou, 120 feet long, one-eighth of a mile above the Red River to keep the water level as high as possible at the pump station intake. [58]

These were certainly changes, but they were not the "extensive and radical" changes promised. Not surprisingly, McNeil Station's new tenants were soon faced with complaints and involved in disputes with the city like their predecessors. In 1894, for instance, the City Council charged that the water system had failed to give satisfaction and had not reduced insurance rates. The Council asked that the works be improved and that a better quality of service be provided. It also voted to investigate the possibility of purchasing the water works, feeling that municipal ownership would bring lower water rates. [59] The Council, however, was informed by the Yourees that the works were not for sale. [60] In August 1897 the city's Board of Health entered the fray, protesting the quality of the water being furnished the city. [61] And in 1898 there were more complaints when the system furnished insufficient pressure at a major fire. [62]

To correct the quality deficiencies in the water system the Yourees remodelled the four Hyatt filters in 1898, replacing the single-piece perforated false bottoms, with their tendency to clog, break, and distribute backwash water poorly, with a grid of small pipes with numerous perforated

brass strainers (Jewell collector heads). The filters may also have been modified from upward to downward flow. [63] To increase water pressures, the Shreveport Water Works Company installed a new low service engine. This engine was a Worthington vertical, triple expansion, condensing engine, ordinarily designed for high service, but modified for low service. The plumbing at the station was arranged so that this pump could be used as a high service engine, however, pumping water directly into the mains, bypassing the filters, in case of fire. [64] With its relatively low fuel costs it was an engine quite appropriate for Shreveport's system. (See HAER photos LA-2-40 and LA-2-41 for views of this engine.)

But these changes brought no immediate alleviation of the rising tide of criticism. In May 1899 the Southeastern Tariff Association, representing nearly all of the fire insurance companies doing business in Shreveport, informed the City Council that in view of the inefficiency of the city's fire department and its water supply, it was declaring Shreveport a third class city. The Council angrily ordered the letter returned to sender. [65] Several months later the Council asked the City Attorney to furnish an opinion on the right of the city to compel the water company to extend mains and pipes beyond the old city limits and the right of the city to insist on "good clean water." The City Attorney was also asked to determine whether the city had the right to expropriate the franchise of the water company before its expiration. At the same time yet another committee was appointed to determine if the Yourees were interested in selling the works. [66]

Faulty equipment installed in the original plant and the lack of extensive experience in the water works field were among the problems which plagued the Yourees during the seven years they controlled the Shreveport franchise. But other problems, beyond their control, had also emerged by the late 1890s to further complicate matters for them. Shreveport doubled in population between 1880 and 1900 (see Appendix IV). The Yourees, with limited capital, were apparently either unable or reluctant to expand the water system to keep up with this growth. Even more critical was the steady decline of the quality of the water supply being used -- Cross Bayou.

In 1887 when Cross Bayou was selected as a permanent source of water for the water system, it was outside the settled areas of the city and unpolluted. By the late 1890s the city's growth had changed this situation. Black tenements had been built upstream from McNeill's intake and drained into Cross Bayou. [67] J.N. Chester, described the stream c1900, as:

for at least seven months of the year, nothing more than a stagnant pool, yielding at its worst bad odors and at its best, as regards sanitary conditions, extreme turbidity and at times excessive hardness, depending on whether the rise, which eliminated the odor and substituted therefore turbidity came from the lake region or the river. [68]

With a water supply that was rapidly deteriorating, under pressure from the City Council, the local Board of Health, and the insurance companies, as well as individual citizens, the Yourees in 1899 decided to sell the works.

Other factors contributed to this decision. In 1898 Peter Youree had been promoted from Vice President to President of the Commercial National Bank, and a few months later Henry Youree was elected Vice President. [69] These new responsibilities may have made it too difficult to manage the water works. The Yourees also acknowledged that they wished to extract the capital they had invested in McNeil for other enterprises. Finally, they conceded that they were not specialists in the operation of water works and had found themselves facing situations and complications almost daily which they could not handle and which were growing steadily more serious as the city grew. [70]

The Yourees apparently offered the plant first to the city, [71] since the Council had expressed an interest in purchase in 1894 and again in early 1899. The asking price was probably around \$200,000. [72] The Yourees offered to accept 7% in cash and the remainder in bonds bearing 4% interest; or to accept the entire payment in bonds bearing 5% interest provided they were exempt from taxes. The city, however, turned down the offer, with Henry Youree observing that it had lost "the opportunity of its life." [73]

Interest in railroads again probably explains the city's reluctance to assume control of its water supply. In 1895 Shreveport's taxpayers had voted a special tax to raise \$250,000 to subsidize construction of the Kansas City, Shreveport & Gulf (later Kansas City Southern) Railroad. In 1896 they had voted to subsidize the Missouri, Kansas & Texas Railroad with \$75,000, and in 1897 to furnish the Shreveport & Red River Valley Railroad with \$60,000. Taxes in the city were higher than usual due to these projects, making the Council and the city's taxpayers reluctant, no doubt, to go further into debt. [74]

The McNeil Pumping and Purification Station and its associated water and sewerage systems were thus sold to the American Water Works and Guarantee Company of Pittsburgh, Pennsylvania. American Water Works was one of the larger holding companies in the utility field during the late nineteenth and early twentieth centuries. In 1899 they already owned over thirty water franchises, several in cities like Birmingham, Alabama, and Little Rock, Arkansas, approximating Shreveport's size and water conditions. [75]

AMERICAN WATER WORKS & GUARANTEE COMPANY (AWWG) AND THE SHREVEPORT FRANCHISE

Like the Yourees in 1892, the new owners of the McNeil Street Station announced plans for extensive modifications to provide better fire protection, purer water, and wider coverage with water mains and sewerage lines. The representative sent by AWWG to Shreveport to conclude the purchase from the Yourees declared that his company intended to satisfy "all just and reasonable demands" and had already made plans to spend \$75,000 to \$100,000 to improve the pumping and filtration machinery. [76]

Similar promises had been made and gone unfulfilled when the Yourees purchased the system in 1892, but this time they were kept. Between 1899 and 1912 the American Water Works and Guarantee Company, through its Shreveport Water Works Company, invested considerably more than the \$75,000 to \$100,000 initially promised and made a very impressive attempt to clear

up the problems which had been plaguing the system since its opening. A review of the modifications, improvements, and additions made to the Shreveport system by AWWG in steam pumping equipment, purification equipment, the pump station building, the source of water supply, and the distribution system supports this analysis.

Steam Equipment:

Very soon after purchasing the McNeil Street Station, AWWG, through the Shreveport Water Works Company, began to expand its steam plant. In 1900 the Company installed a new high service pumping engine -- a horizontal Worthington, triple expansion, condensing duplex steam pump, rated at 3 to 4 mgd. It became the Number 1 high service engine; the two Blake pumping engines from 1887 were used to supplement it. (See HAER photo LA-2-49) To increase the low service pumping capacity a horizontal Worthington compound 5 mgd duplex pump was installed in 1901 on an incline on the bank of Cross Bayou. Mounted on a track, this engine's position could be adjusted as the bayou's level rose or fell. (See HAER photo LA-2-5) [77]

The high service equipment was further improved in 1904 and 1905 by replacing one of the original Blake pumps with another Worthington horizontal, triple expansion, condensing duplex unit (4 mgd capacity) and the other with a newer 2.5 mgd Blake compound condensing engine (an 1898 model originally used in AWWG's Birmingham plant). [78] Finally, in 1911 the low service pump mounted on the incline on the bank of the bayou was placed in a new pump pit, and the 3 mgd water end of the 1898 Worthington vertical, triple expansion, low service unit was replaced with a larger 5 mgd Epping-Carpenter pump. [79] To provide steam generating capacity for these new engines the boiler plant was expanded from three to four units with a new Pennsylvania boiler, placed in an extension of the old boiler room. [80] Thus between 1899 and 1911 the low service pumping capacity of McNeil was increased from 3 to 10 mgd and high service capacity from 2 to 11 mgd (see Appendix II). (See HAER photos LA-2-32 and LA-2-33 for the boiler plant c1911; LA-2-46 to LA-2-48 for views of the high service pumping room c1911)

In addition to these major expansions in steam equipment, there were a host of minor ones. In 1905 and 1911, for instance, new boiler feed water beaters were installed (see HAER photo LA-2-37), and between 1906 and 1909 (the exact date is uncertain) the boilers were converted from coal to natural gas, a new and much cheaper fuel in the Shreveport area. [81]

The basic policy which was followed by the American Water Works and Guarantee Company in selecting steam equipment was spelled out very clearly by J.N. Chester in several of his papers. [82] Chester, who worked for AWWG as a field engineer between 1899 and 1906, observed that reliability, not duty (or high efficiency), was the prime feature sought in steam pumping engines in most stations by his firm. Engineers who charged that water systems were being "pennywise and pound foolish" for installing cheap, low duty engines were themselves in error. With high efficiency (duty), Chester pointed out, came complexity, and with complexity came high first cost, large depreciation costs, high replacement costs, high maintenance costs, high repair costs, and expensive replacement parts. From the viewpoint of an operating engineer, cheap, simple low duty engines brought a better return on investment, especially in small water works, far from stores of replacement parts and skilled mechanics, where pumping was often intermittent.

The savings in fuel resulting from the use of high duty (usually crank-and-flywheel) engines were never sufficient here to make up for the higher first cost and higher maintenance, repair, replacement, and other costs. For these reasons, Chester explained, American Water Works and Guarantee's policy was to install medium priced, direct-acting engines with modest duties and good maintenance and repair records, instead of the expensive, "showey," high duty vertical, triple expansion crank-and-flywheel engines.

Table 7, which indicates the pumping engines commonly employed in water works in the period 1900-1910 and their approximate duty and cost, and Table 8, which lists the 160 engines installed in the forty-one small to medium size plants owned by AWWG in 1908, graphically illustrate how the policies spelled out by Chester influenced engine selection at Shreveport. Two of the engines installed -- the Worthington triple expansion units -- were of the type most commonly installed in AWWG installations. They combined the simplicity and high reliability of direct-acting pumps with moderately low first cost and moderately high efficiency. The Blake compound, condensing engine put into service in 1904 was also one of the more common types used by AWWG for much the same reasons. The one bottom-of-the-line engine installed at McNeil -- the Worthington, compound, non-condensing low service engine -- had poor fuel efficiency. But it was appropriate for certain conditions and hence was also a type frequently used by AWWG. This engine was outside of the main pump station, in a shed on an incline leading down to Cross Bayou. Because it was relatively inaccessible and not as closely watched or maintained as the engines inside the pump station, the relative simplicity and subsequent freedom from maintenance of the non-condensing engine were more important than higher fuel efficiency. Moreover, this engine was only used intermittently as a backup for the Number 1 low service engine, the 1898 Worthington vertical triple expansion pump. Intermittent use made its high fuel costs even less significant. [83]

The appropriateness of these engines for Shreveport's system is evidenced by their long life. The Worthington high service triple expansion engine installed in 1900 was retired only in 1980; the Worthington high service triple expansion installed in 1905 was taken out of service only in the 1960s. The 1898 Blake, used for six years in Birmingham and installed in McNeil in 1904, was retired in 1927, after twenty-nine years of service. The Worthington compound, non-condensing engine, installed on an incline on the bayou and moved in 1911 to a pump pit on the bayou, was retired only in the 1950s, after more than a half century of use. The long operating life of these engines contrasts quite vividly with the short lives and high rate of turnover of the engines installed in McNeil before 1899.

Purification Equipment:

The American Water Works Company's efforts to update McNeil's water purification system are almost as impressive as its efforts to improve the steam plant. In 1900-1901 the filter wing at McNeil was completely overhauled and enlarged. The 32 by 37 foot offset filter room of 1890 was removed, and in its place a larger room, around 32 feet wide by 78 feet long, was constructed as a direct extension of the high service pumping room. Besides the original

Table 7: Duty and Approximate Cost of Steam Pumping Engines Commonly Used
During the Period 1900-1910

	Approximate cost per mgd pumping capacity (excl. boiler)
DIRECT-ACTING ENGINES (usually horizontal)	
1. duplex, non-condensing, compound (typical duty 40)	\$1600
2. duplex, condensing, compound (typical duty 60)	2000
3. duplex, non-condensing, triple expansion (typical duty 75)	
4. duplex, condensing, triple expansion (typical duty 90)	2500
CRANK-AND-FLYWHEEL ENGINES	
1. duplex, non-condensing, cross compound (typical duty 75)	
2. duplex, condensing, cross compound or compound (typical duty 120)	4000
3. duplex, condensing, triple expansion, vertical (typical duty 150)	6000

Adapted from: Charles Hague, Pumping Engines for Water Works (New York, 1907) p. 219; Irving H. Reynolds, "Municipal Water-Works Pumping Engines," American Society of Civil Engineers, Transactions, v. 54 D (1905) pp. 517, 556-557; Hague, "The Present-Day Pumping Engines for Water-Works," ibid., v. 74 (1911) p. 16; Reynolds, "High Duty vs Low Duty Pumping Engines," American Water Works Association, Proceedings, 1907, pp. 212-216 and Table 6 following p. 214.

Table 8: Steam Pumping Machinery in Use in Plants Owned by the American Water Works and Guarantee Company in 1908

	Number	No. at Shreveport in 1908
Direct-Acting, horizontal, triple expansion	41	2
Direct-Acting, horizontal, compound, non-condensing	34	1
Direct-Acting, horizontal, compound, condensing	33	1
Steam turbine-centrifugal pump	13	
Direct-Acting, horizontal, single expansion	8	
Direct-Acting, vertical, triple expansion	7	1
Crank-and-Flywheel, Gaskill	7	
Crank-and-Flywheel, horizontal, cross compound	4	
Rotary steam engine	3	
Direct-Acting, horizontal, high duty attachment	3	
Crank-and-Flywheel, vertical, triple expansion	2	
Crank-and-Flywheel, horizontal, triple expansion	1	
Direct-Acting, vertical, compound, high duty attachment	1	
Direct-Acting, vertical, compound condensing	1	
Motor or gas driven pumps (non-steam powered)	11	

Adapted from: J.N. Chester, "High Duty vs. Low Duty Pumping Machinery from the Operator's Standpoint," American Water Works Association, Proceedings, 1908, p. 738.

four Hyatt pressure filters (each with a capacity of 0.25 mgd), AWWG installed three larger horizontal, New York pressure filters. These were 8 feet in diameter by 30 feet long and had a capacity of 0.75 mgd. [84] (For the expansion of the filter wing see the diagram of Appendix I; Appendix III is a record of filter installation at McNeil. See also HAER photo LA-2-60 for interior view of new wing.)

Further additions to the filter plant followed. In 1905 three 0.5 mgd gravity, rapid sand filters (9 feet 4 inches by 19 feet) were added to the station, and the filter house extended another 25 feet east to house them. [85] (HAER photo LA-2-5 shows the filter house after this expansion) These new units differed significantly from the older ones. The tops of the new filters were open, and the water flowed through the filter sand in the filters under gravity alone, instead of being forced through by the high service pumps. Gravity filters had begun to displace pressure filters in popularity in the late 1890s. Experiments in that decade had demonstrated that filters were extremely effective in reducing the bacterial content of water and that gravity filters were considerably more effective in this area than pressure filters. Gravity filters also had other advantages. Because they were open problems could be detected and repairs made much more quickly and easily than with pressure filters. Because gravity filters could be made rectangular, they were more economical with floor space and could be built in larger dimensions (10 feet diameter was the maximum for pressure filters). Finally, they were, if not cheaper than pressure filters, certainly no more expensive. [86]

The gravity filters erected at Shreveport in 1904-1905 were constructed with reinforced concrete and were among the earliest in the country to make use of this material. The first American reinforced concrete filters had been constructed in 1902-1903 at Little Falls, New Jersey, just two years prior to Shreveport's. [87] Prior to 1902-1903 filters had invariably been constructed out of either wood or (like Shreveport's Hyatt filters) steel. Reinforced concrete offered important advantages in ease of construction and longer life. It neither rotted quickly like wood or rusted easily like steel, and thus it found rapid acceptance in the water works industry in the early twentieth century. (See HAER photo LA-2-67)

In 1908 and 1909 AWWG again made modifications to the filter plant at McNeil. The exterior of the filter house, previously wood frame, was given a brick veneer, and the seven pressure filters were converted to gravity operation. This required, on the Hyatt pressure filters with their vertical cylinders, removing the top and adding 5 feet to their height (increasing it from 8 to 13 feet) so that the water flowing in from the settling basins would have sufficient head for gravity operation. This procedure was much more difficult on the 1900 New York filters, with their horizontally-situated cylinders. Their curved tops were cut out, and vertical walls were extended upwards from the opening so created to give the water sufficient head in these as well. [88] (See HAER photos LA-2-61, LA-2-62 and LA-2-65 for views of the filter room which show the modified pressure units.)

In 1910-1911 the filter plant was enlarged once again. Two more 0.5 mgd concrete gravity filters (11 feet by 17 feet) were added. The filter wing was enlarged this time by adding an extension approximately 14 feet long by

50 feet wide to the north off the extreme eastern end of the filter room (see Appendix I). Finally, in 1912 the 1905 concrete filters were overhauled. [89]

In the first ten years of the Shreveport water franchise only four filter units had been installed. In the first twelve years of AWWG's tenure at McNeil those four were massively modified and eight new filters, of larger capacity, were installed. The filtering capacity of the plant was increased from 1 mgd to over 5 mgd.

In addition, American Water Works also improved other elements in McNeil's purification system. For instance, in 1900-1901 the settling basins' banks were graded, repaired, and sodded, and in 1907 and 1912 repairs were made to the walls of the basins. [90] In 1900 aerators were installed over the low service discharge mains in the settling basins. [91] Aerators can serve a variety of functions -- mixing chemicals with raw water, exposing bacteria to oxidation, eliminating gases dissolved in water thus improving taste and odor. Introduced into water supply systems in America between the 1860s and 1880s, aerators were until 1905 the only known method of taste and odor control for public water systems. [92] It was primarily for this purpose that they were first put into operation at Shreveport. (HAER photos LA-2-72, LA-2-74 and LA-2-75 show the 1900 aerators.)

In 1910 a new coagulation system was also installed, but no data are available on what this change involved. [93] Since coagulants were injected into the filter system in 1890 between the settling basins and the filters, a method considered in error by 1900, it may have involved switching to the application of coagulants before sedimentation, though this modification may have been made much earlier.

Equally important was the 50,000 gallon clear water well installed at McNeil in 1901. This well, used to store filtered water before it was pumped into the mains, was 25 feet in diameter, 20 feet deep. It was built of brick and concrete, covered with a conical roof, and placed adjacent to the high and low service wings of the pump station (see Appendix I). [94] Clear water storage facilities are important to effective pump station operation as a means of assisting the filtration plant in meeting peak load or emergency demands. But the small capacity of the 1901 McNeil clear water well was clearly insufficient for this purpose, since it could have supplied water for only a few minutes' demand. It did, however, serve as an equalizer between the filters and the high service pumps, preventing the pulsations of the latter from being transmitted back to and disturbing the filter beds with subsequent decrease of filter efficiency. [95] (See HAER photos LA-2-9, LA-2-24 and LA-2-25 for views of the clear water well of 1901.)

From a sanitary point of view, however, the most important addition made to the McNeil purification plant by AWWG was provision for disinfection of water. Although disinfectants, usually chlorine or chlorine compounds, were used occasionally in the 1890s, they were not applied on a regular basis until 1908 when hypochlorites (bleaching powder) were applied at the Boonton Reservoir of the Jersey City Water Company. [96] But from there the system spread rapidly, and for good reason. As a means of reducing the

incidence of disease carrying bacteria it was extremely effective. Moreover, the cost of the chemicals required for disinfection was low, they were easy to apply, and the possibility of harmful side effects was minimal.

American Water Works and Guarantee responded almost as quickly to this technological innovation as to the use of reinforced concrete for filters. As early as 1911, and perhaps earlier, sodium hypochlorite or bleaching powder was being used as a disinfectant in Shreveport's supplies. [97] A shed was added on to the south wall of the McNeill Street Station to house the necessary chemical mixing and injection equipment.

Bleaching powder, however, was replaced as the most popular disinfectant in less than a decade by liquid chlorine. Unlike bleaching powder, liquid chlorine did not have to be mixed into solution on site, it did not decline in strength on storage, and it did not increase the hardness of the water. In addition, it was easier to apply, dosages could be more precisely controlled, and it was more efficient. [98] The first permanent liquid chlorine plant for water supply was installed in September 1913. [99] In 1914, around a year later, Shreveport switched to liquid chlorine, purchasing one of the first dozen Wallace and Tiernan chlorinating machines manufactured in this country. [100] Shreveport was among the earliest cities to make use of liquid chlorine on a regular basis, for in 1915 80% of the nation's water works making use of disinfectants were still using bleaching powder. [101]

Exactly where disinfectant chemicals were applied at Shreveport is impossible to determine exactly with surviving records. The bleach room, however, was located near the line from the low service pumps to the settling basins, suggesting that the hypochlorites were applied before coagulation and sedimentation. [102] In 1915 most water systems (57%) applied disinfectants as a final treatment after filtration to reduce or eliminate aftergrowth of bacteria. But 17% of all installations in 1915 and many of the earliest plants that used disinfection added bleaching powder or liquid chlorine before coagulation and settling. [103] Addition of the chemical here reduced the amount of coagulant chemicals required in the settling basins and cut down on taste and odor problems involved in the use of chlorine. The reduced chemical costs would, no doubt, have appealed to AWWG since it was, after all, attempting to make a profit from the Shreveport works.

Pump Station Building:

During AWWG's tenure at McNeill the pump station building, like the filter equipment and steam equipment, was significantly enlarged (see Appendix I for diagram). [104] As already noted, the filter room, attached to the east end of the high service pump room, was enlarged in 1900, 1904-1905, and 1910-1911, increasing in size from around 1000 square feet to around 4000 square feet. On the opposite side of the plant, the boiler room was enlarged 13 feet westward in 1901, and to this extension a 72 foot by 33 foot coal shed was added. Small additions or sheds were occasionally added to the south and west ends of this "coal shed" at various times to house equipment for mixing or feeding lime, alum, and bleaching powder into the water system. At the same time the "coal shed" was being added to the

station, a number of other improvements were being made. In 1901 a small office, approximately 9 feet by 14 feet, was added at the main entrance; a slate roof replaced the 1887 tin roof; the grounds were landscaped; a new Adolphus Custodis smoke stack, located on the south side of the station, replaced the old square stack; and a railroad spur was brought up to the "coal shed" to facilitate the delivery of chemicals. Also, in 1901, a small electric lighting system was installed at McNeil, utilizing a 4" x 5" Sturdevant vertical steam engine which drove by belt a 2.5 kW Crocker-Wheeler three phase generator. [105]

After McNeil was converted from coal to natural gas, much of the space in the old "coal shed" was partitioned off for uses other than coal storage. In 1908, for example, a chemical laboratory, approximately 10 feet by 18 feet, was added (see HAER photos LA-2-76 and LA-2-77), as well as a machine shop to service the station's equipment, and increased chemical storage and mixing facilities. [106] (See HAER photos LA-2-76 and LA-2-77 and drawings 1, 3 and 4 of 10 to trace the external changes made in the McNeil Station building.)

Source of Supply:

Under AWWG's management the Shreveport Water Works Company also made extensive efforts to improve the quality of the raw water supply. Cross Bayou, as already noted, was rapidly deteriorating as a source of raw water by the early twentieth century. Rather isolated when it was designated as the city's water supply in 1886, by the early twentieth century the quality of its water was seriously threatened by city growth. Unsewered Black tenements had grown up in the northern part of the city which drained into Cross Bayou. Stables and a variety of light industries were also now situated in the area and drained into the stream.

The sewer system posed a further threat. One of the water company's primary sewer outflows emptied into the Red River just below the mouth of Cross Bayou. Ordinarily this presented no problems, but when the river rose, some of the sewage was carried back into the bayou and into the proximity of the pump station intake.

Cross Bayou's deficiencies were further aggravated by the formation of a bar at the mouth of the bayou. This prevented wastes from flowing out of the stream during low water months, transforming Cross Bayou into a stinking, stagnant body of water. [107]

AWWG took immediate steps to alleviate this situation. In 1899, for example, just after purchasing the franchise, the Shreveport Water Works Company bored a deep well on the McNeil Station grounds to determine what ground water supplies were available. [108] The results, unfortunately, were negative. Artesian water was struck some 220 feet below ground level, and this water rose to within 40 feet of the surface. But the water was hard (168 ppm) and the volume (70 gallons per minute) insufficient. [109]

The company then turned to available surface waters. One of AWWG's engineers, as early as 1898 or 1899, had investigated Cross Lake, just to the west of the city on the headwaters of Cross Bayou, and had concluded that, some time in the future, it might be turned into a reservoir for the

city. [110] But with only half of the franchise's life remaining, the investment required to purchase thousands of acres of land and convert Cross Lake into a reliable reservoir was apparently greater than AWWG cared to make. Thus the Shreveport Water Works Company turned elsewhere.

The best available nearby surface water supply was Twelve Mile Bayou, the outlet for Caddo Lake, a relatively large body of water around 15 to 20 miles northwest of the city on the Louisiana-Texas border (see Table 9). In 1900 Twelve Mile Bayou flowed into the Red River only about a mile upstream from Cross Bayou. Its waters were relatively soft and were not being polluted, like Cross Bayou's, by human wastes.

In order to bring the waters of Twelve Mile Bayou to Cross Bayou in the low water months when Cross Bayou would otherwise turn into a cesspool, the Shreveport Water Works Company contracted with Southern Engineering and Construction Company of New Orleans in June 1901 to construct a canal 4965 feet long, utilizing the bed of Blind Bayou, to link Twelve Mile and Cross bayous. Estimated volume of excavation was 30,000 cubic yards. [111]

Working conditions in the swampy area between Twelve Mile and Cross bayous presented a whole series of difficulties. Although approximately 20% of the excavation work was carried out by steam dredges, these had to be abandoned because the soil was so soft that vibrations from the dredges caused finished banks to collapse. Around 10% of the excavation was carried out with horse or mule-drawn scrapers. But the soil was so soft that these, too, had limited utility. Almost 70% of the excavation had to be carried out entirely by hand, often by men working on temporary supports since the channel was too soft for them to stand unsupported. Even replacing steam dredges with manpower did not solve the slippage problem. Some sections of the canal bank continued to collapse, requiring constant re-excavation. In one case a section of 300 feet settled vertically 8 feet, raising the bottom of the already excavated channel by 5 to 6 feet.

If these problems were insufficient, there were others to plague the project. In the summer of 1902 the Red River flooded, overflowed into Twelve Mile Bayou and into the completed portion of the canal, partially filling it with sediment. In all 7500 additional cubic yards of material had to be removed due to bank slippage and sedimentation, raising the total volume excavated by 20% over initial estimates. Moreover, most of this work had to be carried out by the Shreveport Water Works Company since the original contractor failed in August 1901, when work had scarcely begun. The canal was completed only in 1903. [112] (See HAER photos LA-2-86 and LA-2-87 for views of a portion of the channel linking Cross and Twelve Mile bayous.)

To provide an impounding reservoir for the diversion of water from Twelve Mile to Cross Bayou, the Shreveport Water Works Company at the same time erected a timber sheet pile dam on Twelve Mile Bayou about 200 feet below the mouth of the new canal. In constructing the dam the company experienced many of the same difficulties as in constructing the canal. The site was isolated, away from established means of transportation in a swampy area, so most of the timber had to be rafted to the site. Moreover, as the dam neared completion, a flood washed out one end of the structure, requiring

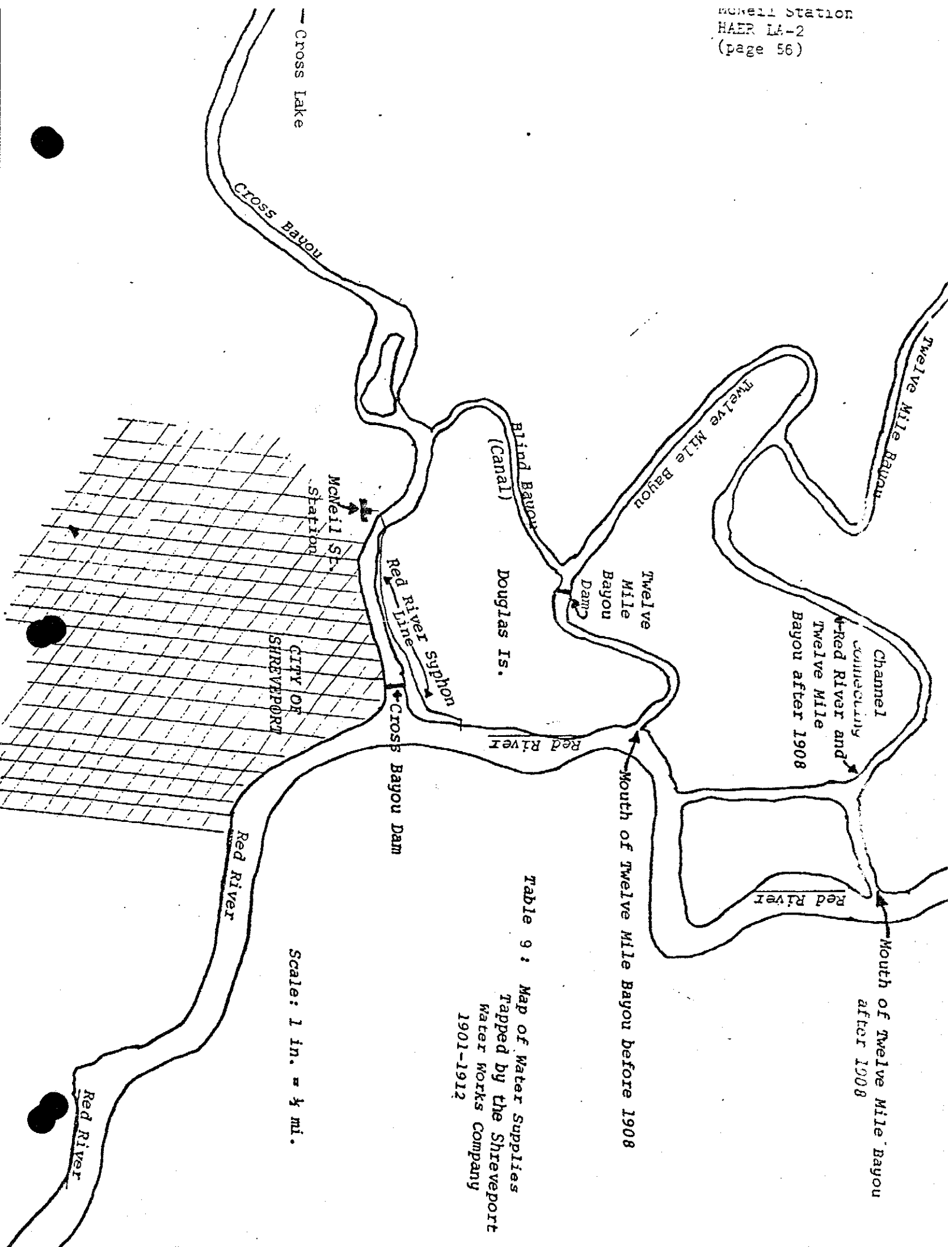


Table 9 : Map of Water Supplies
Tapped by the Shreveport
Water Works Company
1901-1912

Scale: 1 in. = $\frac{1}{4}$ mi.

extensive reconstruction work. When completed the Twelve Mile Bayou dam impounded water to a height 10.25 feet above the river gauge, hacking it up 10 miles and providing storage of approximately 1 billion gallons. [113] (See HAER photos LA-2-84 and LA-2-85 for views of the dam.)

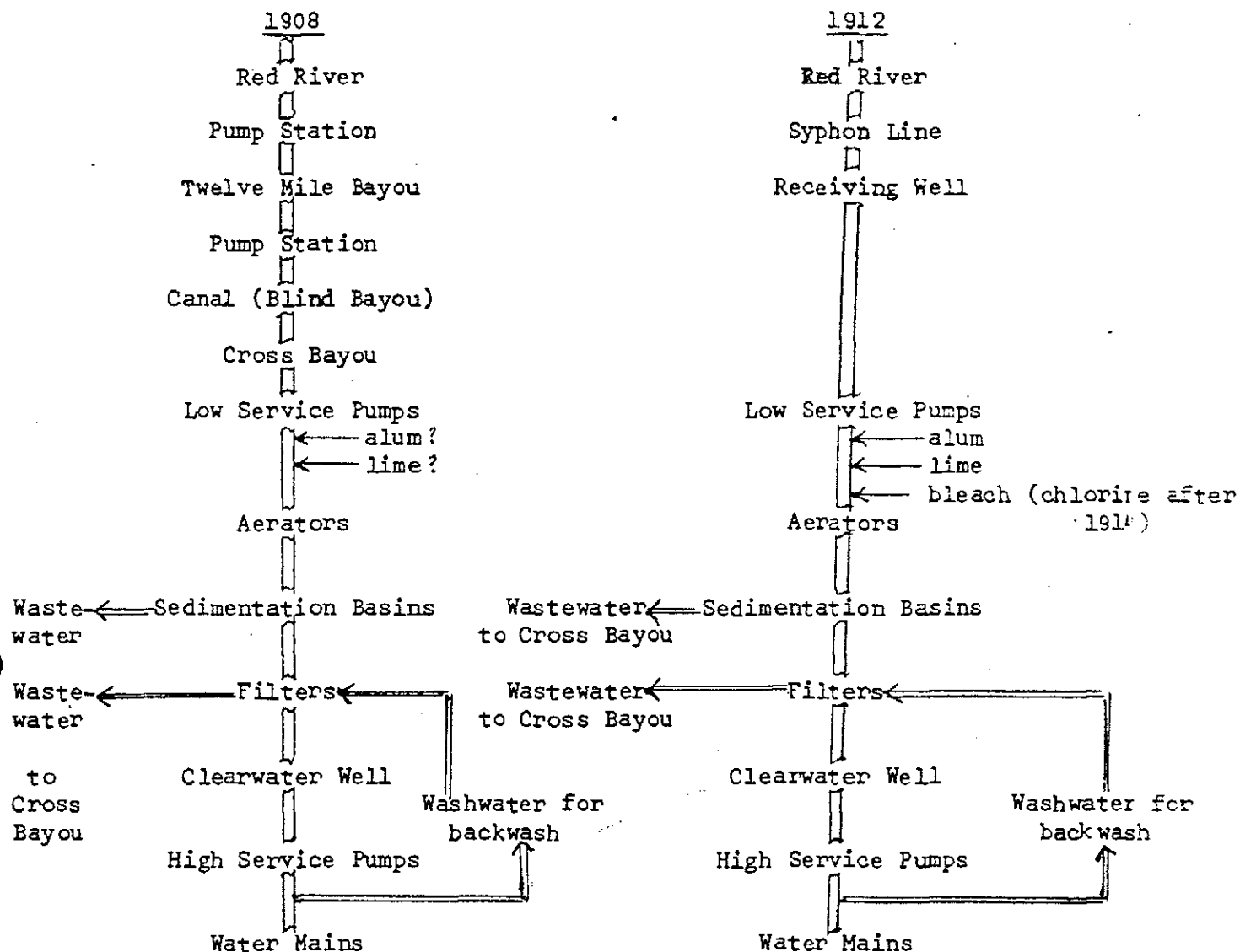
In 1907, in order to insure the flow of water from Twelve Mile Bayou to Cross Bayou at low water stages, the Shreveport Water Works Company erected a pumping station near the dam. This station took water from above the dam and pumped it into the canal under a 12 foot head. The pumping station was initially simply a 40 hp locomotive boiler mounted on timber skids and provided with gas grates and burners and a small steam pump. [114] In 1908, however, the original boiler was replaced with a 80 hp boiler, and both boiler and engine were housed in a shed. [115] In 1912 the Caddo Levee Board erected a levee for flood protection in the area. It crossed the canal around 600 feet west of the entrance. This compelled the water company to extend the discharge main of the pump. It also led to some redesign work on the system. Since it was now necessary to pump the water over the levee, a 45 foot lift, syphon action was employed, with the pumping station used as an aid in this process. [116] (See HAER photos LA-2-88 and LA-2-91 for views of the Twelve Mile Bayou pumping station c1911-1913)

In 1907 and 1908 the Shreveport Water Works Company began extensive survey work, apparently hoping to develop Twelve Mile Bayou as the sole source of Shreveport's water supply. [117] The company, however, was already having difficulties protecting this stream even as a supplementary supply of water. In 1904-1905, for example, the Red River had begun to shift westward, eating into the thin isthmus that separated it from Twelve Mile Bayou at a point about 4 miles north of Shreveport. The company built a cut-off wall or dam at this point to restrain the river. [118] But this proved to no avail. The Red River broke into Twelve Mile Bayou anyway, silting up the channel above the Twelve Mile Bayou dam and reducing the amount of water available in the impounding reservoir.

The 1908 Red River flood forced complete abandonment of the plans being developed for Twelve Mile Bayou. After the flood the course of both the Red River and Twelve Mile Bayou above Shreveport were altered, with Twelve Mile Bayou entering the Red approximately three miles above the 1903 dam and impounding reservoir. [119] While some water was still available at the auxiliary pump station site for pumping into the canal and down to Cross Bayou, silting of the old channel steadily diminished its volume, and the water reaching the station now contained varying percentages of Red River water. A committee from the City Council visiting the bayou in the summer of 1909 reported that Twelve Mile Bayou's old channel was rapidly disappearing, that one or two more overflows of the Red would completely destroy it, and that a new water supply was absolutely necessary. [120]

As the volume of water available at the impounding reservoir and pump station on Twelve Mile Bayou declined, the Shreveport Water Works Company was compelled to establish yet another auxiliary pumping station. This station, erected in 1909, was called the Red River station. Located at the new mouth of Twelve Mile Bayou, 4 miles north of Shreveport, it pumped water from the Red River into the old bed of Twelve Mile Bayou and consisted of a 20 mgd gasoline motor driven pump mounted on a track so it could be moved easily as the river's level changed. [121]

Table 10: Flow Diagram: The Shreveport Water System and the McNeil Street Station in 1908 & 1912



Note: In spring when water was plentiful in Twelve Mile Bayou use of the Red River and its pumping station were not necessary.

Between 1908 and 1911 Shreveport's water supply system was in a rather precarious state since it depended on three different pumping stations during the summer months when Cross Bayou's level was low. The failure of any one would have cut off or sharply diminished the city's supplies. (See Table 10 for a flow chart of Shreveport's water system during this period.) Water had to be pumped first from the Red River into Twelve Mile Bayou's old bed at the Red River auxiliary station; then it had to be pumped from the impounding reservoir on Twelve Mile Bayou into the canal leading from Twelve Mile Bayou to Cross Bayou by the Twelve Mile Bayou auxiliary station; and, finally, it had to be pumped from Cross Bayou into the city mains by the McNeil Street Pumping Station.

The deteriorating nature of Cross Bayou and the precarious nature of the three pumping station system in use after the 1908 flood, plus growing public criticism of the water being supplied, were probably the primary factors which led the Shreveport Water Works Company to quickly abandon this system.

In 1911 the water company decided to tap the Red River directly from the McNeil Street Station by means of a mile long, 30-inch diameter syphon line (20-inches diameter at intake), with a capacity of 8.5 to 10 mgd. Estimating costs for the project at around \$50,000, the company asked the City Council in April for permission to tap the Red River (necessary because the franchise ordinance specifically indicated Cross Bayou as the source of water supply) and for a financial subsidy to offset the costs of the project. [122] After the Council approved the change and the subsidy, construction was begun, and the line was completed by October 1911.

The intake of the Red River syphon line was placed in the Red River a few hundred feet above the mouth of Cross Bayou, held by iron hangers from timber joists supported by piling. From the river bank the syphon line ran first south and then southwest along the southern shore of Douglas Island to a point directly opposite the McNeil Station (see Table 9). It was carried across Cross Bayou on timber piles to a receiving well, 15 feet in diameter, 52 feet high. The syphon emptied into the receiving well at a level 7 feet below its intake, after overcoming a syphon head of 20-21 feet. An 8" x 20" x 2 Alberger crank-and-flywheel vacuum pump, located in the low service room of the pumping station, was used to prime the line. [123] (See HAER photos LA-2-92 to LA-2-95 for views of the syphon line, also photos LA-2-6, LA-2-7 and LA-2-11.)

In conjunction with this system a large cylindrical brick pump pit was erected a few feet (25 feet from center to center) to the east of the receiving well. The horizontal, compound Worthington low service duplex pump, previously located on a track on the bank of the bayou, was placed in this structure. [124] It, too, was linked by tunnel to the receiving well. The auxiliary pumping stations on the Red River and Twelve Mile Bayou used in conjunction with the previous water supply system were kept in place as an emergency supply should the syphon line fail. [125] (See HAER photos LA-2-28 and LA-2-29 for views of the 1911 low service pump pit; it also appears in other photos, e.g., LA-2-6 and LA-2-7.)

From a sanitary viewpoint the water supplies the city received from the Red River after October 1911 were undoubtedly better than Cross Bayou water. But this advantage was offset, in the eyes of most consumers, by other problems. Red River water, as noted, was extremely hard. This made it undesirable for washing and for industry (it encrusted boilers). In low water months, moreover, Red River water was so salty as to be, at times, hardly potable. [126] Spring and cistern water thus remained popular for many domestic uses, even among those with water connections. [127]

In spite of this, however, the record of the American Water Works and Guarantee Company in attempting to secure for the city of Shreveport an acceptable water supply between 1899 and 1912 merits some praise. That the company did not enjoy more success was due more to the geography and hydrology of the region than to any lack of effort on AWWG's part.

The Distribution System:

The distribution system was expanded steadily during AWWG's management of the McNeil Street Station. Between 1887 and 1899, before the holding company took charge of the system, the number of miles of water mains grew by only around 10 miles, from 8.5 to 18. In the next twelve years, from 1899 to 1911, 26 miles were added to the system, bringing the total to 44 miles. [128] In 1887 the system had only 106 fire hydrants; twelve years later the figure was only 150. But during the seventeen years that American Water Works and Guarantee Company controlled the Shreveport Water Works Company the number was drastically increased. By 1916, when the city purchased the system, there were almost 500. [129] There was a comparable growth in the number of consumers. In 1887 there were only 434 customers tied into the mains. In 1900, the year after AWWG bought the McNeil works, the figure stood at only around 1000. But by 1913 there were almost 4000 customers. [130] In 1900 the ratio of customers to total population in Shreveport was 1:18; by 1910 the figure had dropped to 1:9.

The performance of the American Water Works and Guarantee Company as franchise agent in Shreveport, particularly during the period 1899-1911, is impressive. The company not only greatly expanded the pumping and filtering capacity of the plant, but kept the plant fully abreast of the latest technological developments in water purification equipment and installed pumping engines appropriate to local conditions. AWWG also greatly expanded the physical plant which supported the pumping and filtration equipment and launched major drives to secure purer water supplies for the city. Finally, during AWWG's tenure extensions were made to both the water and the sewer systems at a rate greatly exceeding previous franchise holders in Shreveport.

These efforts were occasionally recognized by municipal officials, as well as other observers. In 1902, for instance, Mayor Ben Holtzman and the local Public Health Officer complemented the company for its "rapid" expansion of water and sewer mains throughout the city and attributed the city's improved sanitary condition in part to this work. [131] In 1904 the Progressive League of Shreveport declared that Shreveport's water was,

"in purity and wholesomeness" second to none in the country. [132] And Brueggerhoff's 1906 city directory declared that no better water could be found in any Gulf state and not much better anywhere. [133] The latter comments, however, were more local boosterism than anything else.

A few years later, compliments on the system were more reserved as the Twelve Mile Bayou system began to collapse. In 1909, for instance, a committee of the City Council conceded only that the water company had done "as well as can be expected" considering the source of supply (Cross Bayou) it was having to use, and the city's Public Health Officer seconded this comment in his report to the Louisiana Board of Public Health. [134]

Perhaps a more neutral observer was the sanitary engineer, F.W. Witherell, who in 1907 investigated charges that the water being supplied by the water company was contaminated. Witherell in his report praised the Shreveport Water Works Company in highest terms for the efficiency of its filtration plant. The plant, he noted, was providing water which was extremely pure from a sanitary point of view and had a capacity more than adequate to meet the demands of the city. He noted, also, that the engineer who supervised the plant was "a careful man" and pointed to Shreveport's relatively low typhoid death rate in the early 1900s as proof of his contention that the city's water was of high quality from a sanitary viewpoint. [135]

THE CITY AND THE FRANCHISE, 1899-1911

In view of the rather impressive performance of the American Water Works and Guarantee Company in enlarging and improving the water system in Shreveport during the first dozen years of its tenure, one might expect an improvement in city-franchise relations. This was not to be the case. AWWG had no better relations with the City Council than its predecessors.

In June 1900, shortly after American Water Works had purchased McNeil, Council Minutes included complaints about the bad odor of the water being supplied. [136] In October, citing the "very bad water" being furnished by the Shreveport Water Works Company, the Mayor urged the Council to consider a proposition to furnish the city with artesian water. [137] Shortly after this, problems with water pressure led to the passage of a resolution by the Council requiring the water company to place a pressure gauge on the standpipe in full public view. [138] This spurt of complaints culminated in April 1901 when the Council telegraphed the General Manager of the Shreveport Water Works Company at AWWG headquarters in Pittsburg, asking him to send an authorized representative to adjust the growing differences between company and city, threatening, if action were not taken, to annul the franchise. [139]

AWWG sent J.N. Chester, their field engineer, to meet with the Council. Chester explained that part of the system's pressure problems were due to the extensive repairs and extensions which the company had undertaken (in 1900-1901, as noted previously, a large number of major changes were made at McNeil). A committee from the Council visited the station and confirmed his contention. They found that the plant was undergoing extensive

repairs and that the water company was in the process of attempting to tap Twelve Mile Bayou water. The Council thus accepted Chester's promise that the city would have good filtered water by July 1, 1901. [140]

The truce, however, was temporary. In late 1902 a defective fire plug at a major fire caused the loss of \$600 worth of hose and cost the city \$100 in firemen's wages. Andrew Currie, ex-Mayor, now chairman of the Council's "Fire Committee," responded by securing passage of an ordinance deducting \$700 from the bill due the water company. [141] At a subsequent meeting a committee was appointed to examine the contract with the water company to determine if the city were paying anything in excess of contract. [142] In November 1902 newly elected Mayor Andrew Querbes urged on the Council the necessity of purchasing the water and sewerage systems and recommended creation of a committee to take up the matter. [143] In 1903 the two sides exchanged volleys -- the city complaining that the company had not repaired streets properly after extending its mains; the company warning the city that it would not be responsible for pressure problems if the city continued its "indiscriminate" use of street hydrants for flushing gutters. [144]

The new steam pumping units added to McNeil in 1904-1905 apparently eliminated the problem of insufficient pressure in the mains. But in 1905 a dispute broke out over the interpretation of the water rates being charged consumers. The franchise ordinance set flat rates which the franchise holder could charge customers. For example, a house of four rooms connected to the system paid \$6 per year. If there were more than four rooms, an extra \$1 was added for each room. For a bathtub the fee was an additional \$3 per year; \$5 for a water closet. For sprinkling (an outside tap) the fee was \$3. In the interval after initial connection some customers had undoubtedly added extra taps, extra rooms, or extra bathroom appliances. A company inspection in 1905 apparently uncovered some of these and resulted in increased water bills and, subsequently, complaints by customers to the Council about these bills. [145] Further complicating the matter was the problem of interpreting the ordinance. For example, if a customer only had a bathtub tap or a tap for water sprinkling in the front yard, was he to be required to pay only \$3 per year, or \$3 plus \$6 (the base charge for a four room house connected to the system)? This matter was cleared up by the courts. In November 1905 they defined more precisely the rate structure outlined in the franchise ordinance, interpreting a basic house connection as a "sink" connection and disallowing the base charge when only a bathtub or outside (sprinkler) tap was in use. [146]

In the meantime, the Shreveport Water Works Company, in an attempt to avoid the problem of flat rates and reduce per capita consumption to avoid having to increase pumping or purification facilities, had begun a campaign to permit customers to apply for meter rates instead. But Andrew Currie protested that the franchise ordinance did not permit the company to move from a flat to a metered rate and that its actions violated the charter enough to justify annulment and forfeiture. [147] These disputes led to the passage of another resolution by the Council authorizing a committee to determine if AWWG was interested in selling the system and the purchase price. [148] But, having made numerous improvements at McNeil, American Water Works was apparently not interested.

In November 1906 Mayor-elect E.R. Bernstein pointed to the high rates the city was paying for water and renewed the call for municipal ownership. [149] The Council, perhaps responding to this call, appointed a committee in January 1907 to investigate possible changes to the city's water supply, making the city's Public Health Officer, J.A. Blanchard, chairman. [150] Blanchard reported back to the Council in July 1907, after consulting not only with water company officials, but with Major F.M. Kerr, Chief of the State Engineering Office; A.L. Metz, chemist of the State Board of Health; and F.W. Witherell, a sanitary engineering consultant, among others.

Blanchard and his associates found that water drawn from Cross Bayou, even if diluted in times of shortage by water from Twelve Mile Bayou or the Red River, was suspect. Blanchard noted that the Bayou was often stagnant and surrounded on its lower reaches by manufacturing plants, stables, outhouses, and dwellings. He reported, also, that filthy surface drainage flowed into the bayou during rainstorms and that it was possible that sewage from the outfall just below the mouth of Cross Bayou was backed up to the pump station intake when the Red River flooded. Blanchard reluctantly confessed that the contamination of Cross Bayou was probably primarily the result of surface drainage, and hence not yet a serious hazard to public health. But he pointed out that samples taken of Cross Bayou water had occasionally begun to show the presence of bacilli colli communis, a bacteria usually associated with human wastes. Attempts to detect these bacteria a few years earlier had proven negative.

Blanchard admitted the filtering system at McNeil was operating very effectively in removing bacteria. But he argued that it could not be counted on to do this indefinitely. He thus strongly urged the City Council to take action, before it was too late, to alter the source of the water supply. He argued strongly for the use of Red River water. Because there were no major urban areas on the Red above Shreveport, it was completely uncontaminated by human wastes. It had sufficient volume to purify itself if polluted and to supply any conceivable needs of the city, and, Blanchard pointed out, its use would not involve the city in any legal difficulties. Blanchard observed that there was a strong prejudice in the city against use of the Red due to its hardness and occasionally salty taste, but, he pointed out, these were not health hazards and could be accepted by an educated public. [151]

Blanchard's contention that Cross Bayou was becoming contaminated by human sewage gains some support from the city's typhoid death rate between 1890 and 1904. The rate per 100,000 population rose from 23.4 between 1890 and 1894 to 27.0 in the 1895-1899 period, to 63.2 in the 1900-1903 period, although some of the massive increase in the latter period may have been due to returning Spanish-American War veterans. In 1903 the Shreveport Water Works Company completed the canal to Twelve Mile Bayou, and the typhoid rate began to fall. It was only 25.2 in the period 1904-1907. [152]

Despite Blanchard's report and the deteriorating nature of Cross Bayou, no immediate action was taken. The delay is understandable. Water being pumped in from Twelve Mile Bayou was diluting contaminated Cross Bayou water during the worst period of the year, and Witherell's report [153] had indicated that Cross Bayou water was still being satisfactorily purified by

the McNeill facilities. Moreover, both the City Council and the general public may well have preferred the usually soft water being furnished to the hard Red River water recommended by Blanchard, especially since the latter was unattractive to industry.

The 1908 Red River flood, however, changed the situation. The principal objection to the use of Red River water had been its hardness. But after the Red River broke into Twelve Mile Bayou and the Red River auxiliary station was installed, the Shreveport Water Works Company was, in effect, serving the city Red River water during part of the year. By 1909 the water being pumped into city mains contained the worst of both worlds -- a mixture of Cross Bayou water (soft but suspect from a sanitary viewpoint) and Red River water (safe from a sanitary point of view, but very hard). While the resulting mixture could be purified of dangerous bacteria, it could not be softened, and the hard water occasionally being served may have been responsible for a rash of water related complaints in late 1908. In September, for example, the Council, on motion of ex-Mayor Currie, appointed a committee to investigate the water supply. [154] This committee reported that part of the franchise's difficulties were due to the continued use of Cross Bayou, the supply stipulated in the original franchise ordinance. While the committee obviously desired a new source of supply, it argued that the city was under no compulsion to furnish monies for such and that if the company could not or would not expend the capital to go elsewhere it would simply have to relinquish its contract. The failure of the supply stipulated in the franchise, the committee concluded, did not justify the company's failure to provide pure water. [155]

No action was immediately taken on the issue, but remarks made at the transfer of power in the city's government following the November 1908 elections made it certain that the Shreveport Water Works Company was to enjoy no respite from criticism. The outgoing Mayor, E.R. Bernstein, in his parting remarks, called the improvements made by the water company inadequate and called for municipal ownership, saying that the health of the city was more important than monetary considerations. Bernstein's replacement, S.A. Dickson, echoed Bernstein's demand for municipal ownership in his inaugural message. [156]

In early 1909 the city began a new study of alternative sources of supply. [157] In August the Council's "Water Committee" reported that even though the water near the intake at McNeill seemed presently clear and free of objectionable matter and even though the water company had done as well as could be expected using Cross Bayou water, Twelve Mile Bayou, the source of the water used to supplement Cross Bayou during the summer months, was in danger of drying up. Only further deterioration of Cross Bayou could be expected. [158] The Council, in response, began to lay plans to insure municipal control over the bed of Cross Lake as a future water reservoir (to be discussed in more detail in Chapter IV). [159]

In November of 1910 yet another new Mayor, John Eastham, criticized the Shreveport Water Works Company. Eastham, in his inaugural address, condemned the existing water supply as "unfit for the needs of our people." Each year in summer, he declared, when water was needed most, the supply served was "unwholesome," taken from a point in the bayou "little short

of a cesspool." Since the water company had been "repeatedly urged" to correct the present "unbearable situation" and had not responded sufficiently, Eastham promised to take action, beginning with a review of the contract with the franchise to determine the possibility of city acquisition. [160]

It was against this background that the Shreveport Water Works Company introduced its proposal to move its intake to the Red River in early 1911. In April the City Council consented, perhaps seeing this as an opportunity to get an improved water supply without having to purchase the plant itself or undertake long and expensive legal remedies. [161] Ordinance 22 of 1911 empowered the Shreveport Water Works Company to make the necessary changes to take a water supply from the Red River above the mouth of Cress Bayou. The city agreed to pay annually to the water works company the interest on the cost of the modifications until the date the franchise expired (6% per year on a sum not to exceed \$50,000). A special tax was levied to cover this commitment. [162]

The additions at the McNeil Street Station made in 1911 and 1912 in conjunction with the erection of the Red River syphon line were to be the last major improvements made during the life of the Shreveport franchise. Beginning in 1911 relations between city and franchise owner, already bad, deteriorated further, leading to a long and sustained campaign for municipal ownership. This campaign and the factors behind the continuing bad relations between the franchise owner and the city, despite the former's impressive efforts to improve the system, will be reviewed in the next chapter.

Chapter II: Notes

1. Baker, Manual, 1891, p. xlii. See also "Franchises of Water Works Companies," Engineering News, v. 27 (1892) p. 38.
2. Baker, Manual, 1891, pp. xl-xlii.
3. Ibid., p. xlii.
4. J. Nelson Tubbs, "Particulars in which Municipal Officers Should Protect the Municipal Corporation in Granting Water-Works Franchises to Private Companies," Engineering News, v. 27 (1892) p. 518.
5. Ibid., pp. 518-519.
6. Baker, Manual, 1888, pp. 176, 178, 223, 273, 283, 284, 298, 305, 311, 315, 316, 331, 332, 339, 402, 481.
7. Ibid., pp. 176, 284, 288, 298, 305, 332, 339-340, 481.
8. Shreveport City Council, Minutes, July 29, 1887.
9. Baker, Manual, 1888, pp. 283-285.
10. There are no detailed contemporary descriptions of the McNeil Street Station in 1887. This data is drawn from the descriptions and data provided in Worley & Black, Engineers, "Report on the Physical Value of the Shreveport Louisiana Water & Sewer Systems," December 1911, pp. 8-10; Shreveport Water & Sewerage Department Drawing 2063 (August 25, 1899); and Sanborn-Parris Map Co., Insurance Maps of Shreveport, May 1896 and August 1899 (sheets showing plan of McNeil Street Station).
11. Baker, Manual, 1888, p. lxxxvi.
12. The settling basins are described in Worley & Black, "Report," 1911, p. 17. For Chester's comment on the settling basins see: Chester & Fleming, Engineers, "Report on Water Supply for City of Shreveport, Louisiana," March 1919, p. 7.
13. Baker, Manual, 1888, p. lxxi.
14. Baker, Manual, 1891, p. xix (see also pp. xix-xxviii).
15. Baker, Manual, 1888, pp. lxxxiii, lxxxv.
16. Baker, Manual, 1891, p. xix, and George A. Johnson, The Purification of Public Water Supplies (Washington, 1913) [USGS Water-Supply Paper 315] p. 17.

17. Shreveport City Council, Minutes, July 29, 1887; also, Engineering News, v. 18 (1887) p. 120 [under 'Construction News']. The sewerage system installed by Bullock at the same time consisted of around 7 miles of mains with eighteen Field's patent flush tanks of 150 gallons per flush. Discharge was to the Red River below the mouth of Cross Bayou.
18. Baker, Manual, 1888, p. 285 (for Bullock as President); Shreveport Water Works Company, "Schedule of Property and Data Prepared for the Use of the Appraisal Board," February 1913, p. 44, says Crawley was Fuller's assistant and became superintendent. Crawley was definitely superintendent in the 1890-1892 period, but Baker, Manual, 1888, p. 285, lists the local superintendent as T.E. Baker.
19. Shreveport City Council, Minutes, September 13, 1888.
20. Ibid., February 16, 1889.
21. Engineering News, v. 21 (March 9, 1889) p. 226.
22. Shreveport City Council, Minutes, May 3, 1889. The ordinance on sewer connections appears in the Shreveport City Council, Minutes, December 8, 1887, and is reprinted in Worley & Black, "Report," 1911, pp. 160-163.
23. Baker, Manual, 1891, p. 182.
24. Engineering News, v. 22 (July 13, 1889) p. 47.
25. Baker, Manual, 1891, p. 182.
26. "Towns Sewered on the Franchise Plan," Engineering Record, v. 21 (1890) p. 267.
27. Worley & Black, "Report," 1911, p. 7, notes that the works were owned by the First National Bank of New York during this period.
28. The only description of the 1890 filters which could be located was found in the Daily Caucasian, January 28, 1890. Several other sources erroneously place the date of construction of Shreveport's filters in 1892, for example, Shreveport Water Works Company, "Schedule and Data," 1913, p. 45. Pressure filters similar in appearance to Shreveport's are pictured in Albert R. Leeds, "Water Purification and Filtration in the United States," Cassier's Magazine, v. 11 (1896-1897) p. 311 [Jewell pressure filters at Chattanooga, Tennessee]. Shreveport's filters are pictured in Shreveport Progressive League, Shreveport of To-Day, September 1904, p. 47. The injection of coagulants immediately before the filters instead of prior to or in the settling basins was common in early mechanical filtration systems -- see, e.g., Leeds, "Water Purification," p. 313, and [Philip Bargess], "The Development of the Mechanical Filtration Plant," Engineering News, v. 59 (1908) p. 250.

29. For the introduction of rapid sand filtration see M.M. Baker, The Quest for Pure Water: The History of Water Purification from the Earliest Records to the Twentieth Century (New York, 1949) pp. 179-195 and following. See also John Goodell, Water-Works for Small Cities and Towns (New York, 1899) p. 193.
30. The advantages of pressure filters are discussed by Harold C. Stevens, "Pressure Filters," American Water Works Association, Journal, v. 3 (1916) pp. 388-397, 750-778 (discussion).
31. Shreveport's system was typical in a number of respects. For example, prior to 1890 most American mechanical filter plants made use of pressure filters, like Shreveport's. Allen Hazen, The Filtration of Public Water-Supplies (New York, 3rd ed., 1900) p. 180, noted that many of the earlier mechanical filters were of the pressure type, and his Appendix IV (pp. 247-250), which listed cities and towns using mechanical filters, indicates that prior to the early 1890s pressure rapid sand filters greatly outnumbered gravity rapid sand filters. Moreover, Hyatt filters, the type used at McNeil, were the most popular type in 1890 (see "The Filtering Plants of American Water-Works," Engineering News, v. 24 [1890] p. 59). It was also not uncommon in this period to inject the coagulant in the lines immediately before the filter instead of in or before the settling basins, as already noted.
32. George A. Johnson, "Present Day Water Filtration Practice," American Water Works Association, Journal, v. 1 (1914) p. 73; also John W. Alvord, "Recent Progress and Tendencies in Municipal Water Supply in the United States," ibid., v. 4 (1917) p. 282.
33. "Filtering Plants," pp. 58-60.
34. F.E. Turneure and H.L. Russell, Public Water-Supplies (New York, 1901) p. 471.
35. Daily Caucasian, January 28, 1890.
36. Times, August 7, 1891.
37. Shreveport City Council, Minutes, August 13, 1891.
38. The letter is recorded in the Shreveport City Council, Minutes, December 10, 1891.
39. Ibid., January 14, 1892. The Fire Department did, however, note that water pressures had been "very fair" over the preceding year with two or three exceptions during the summer.
40. Progress, May 21, 1892.
41. Progress, May 28, 1892, and June 4, 1892.
42. Progress, August 13, 1892.
43. Progress, September 3, 1892.

44. For the ordinance see Shreveport City Council, Minutes, December 8, 1887. It is reprinted in Worley & Black, "Report," 1911, pp. 160-163.
45. Baker, Manual, 1888, pp. 224, 285, for plants Bullock still owned. See note 6 above for the plants he had constructed prior to 1888.
46. "Sewerage by Franchise," Engineering Record, v. 21 (1890) p. 273. The phrase seems to refer to the builder of the Shreveport system, since Shreveport's sewerage franchise was under discussion in the article, but there is, admittedly, some ambiguity which may very well have been intentional.
47. Shreveport City Council, Minutes, August 13, 1891.
48. Shreveport Water Works Company, "Schedule and Data," 1913, p. 45.
49. For discussions of the factors influencing engine choice in the 1880s and 1890s see the articles: Alfred R. Wolff, "On the Selection of Steam Pumping Machinery," Engineering News, v. 16 (1886) p. 195; Charles L. Newcomb, "Water Works Machinery," Cassier's Magazine, v. 10 (1896) pp. 168-191; Wynkoop Kiersted, "American Practice in the Use of Steam for Pumping Water," Cassier's Magazine, v. 10 (1896) pp. 224-231; Charles A. Hague, "Pumping Machinery," American Water Works Association, Proceedings, v. 17 (1897) pp. 152-156; "The Relative Economy of High-Duty Pumping Engines," Engineering News, v. 28 (1892) p. 589; and Frank H. Pond, "Pumping Machinery for Water Works," Engineering News, v. 13 (1885) pp. 340-341; and William M. Barr, Pumping Machinery (Philadelphia, 1893) p. 200f.
50. Shreveport Water Works Company, "Property and Data," 1913, pp. 44-45.
51. Ibid., p. 45, mentions a single horizontal Gordon compound condensing pump on the incline of Cross Bayou, but Sanborn-Parris Map Co., Insurance Maps of Shreveport, May 1896, mentions "2 Gordon Compound pumps" on its cover sheet. The map of the McNeil Station in that series, however, indicates only one Gordon compound pump, but places it in the pump station pit.
52. Times, September 2, 1892, and Shreveport Water Works Company, "Schedule and Data," 1913, pp. 26-31.
53. Shreveport Water Works Company, "Schedule and Data," 1913, pp. 26-31, for the "Charter of the Shreveport Water Works Company" of 1892.
54. For biographical sketches of Peter and Henry Youree see McLure and Howe, History of Shreveport, pp. 228-231. For Peter Youree see also Biographical Memoirs of Northwest Louisiana, p. 105.
55. Times, September 2, 1892.
56. Shreveport City Council, Minutes, January 16, 1893.
57. Ibid., March 9, 1893.

58. Shreveport Water Works Company, "Schedule and Data," 1913, p. 45, lists the modifications made in the water system when the Yourees were its owners. On the Cross Bayou dam, however, see Worley & Black, "Report," 1911, p. 47 (they list it as being constructed in 1892). I have assumed that it was erected by the Yourees, though it could have been erected prior to their assumption of ownership. The "Schedule and Data," p. 47, however, says an impounding dam was erected at the lower end of Cross Bayou in 1908, not 1892, although this could have been a completely new dam.
59. Shreveport City Council, Minutes, April 30, 1894.
60. Ibid., June 14, 1894.
61. Ibid., August 5, 1897.
62. Progress, November 5, 1898.
63. Shreveport Water Works Company, "Schedule and Data," 1913, p. 45.
64. Ibid., p. 45; Worley & Black, "Report," 1911, p. 18. This pump remained in service until the 1960s, when it was finally retired.
65. Shreveport City Council, Minutes, May 8, 1899.
66. Ibid., July 6, 1899.
67. For a description of the declining sanitary condition of Cross Bayou see the report delivered to the City Council by the city's Public Health Officer in Shreveport City Council, Minutes, July 9, 1907 (Report of J.A. Blanchard).
68. Chester & Fleming, "Report," 1919, p. 4.
69. McLure and Howe, History of Shreveport, p. 229.
70. Times, July 9, 1899.
71. Journal, July 10, 1899.
72. Journal, August 7, 1914 (in comments by Judge Pugh).
73. Journal, July 10, 1899.
74. For the city's continuing commitment to railroads see Shreveport Times, May 20, 1896 (Railroad and Souvenir edition), which notes that every railroad entering Caddo Parish had been subsidized, with the biggest subsidy of all going to the Kansas City, Shreveport & Gulf Railroad. See also McLure and Howe, History of Shreveport, pp. 91-92.
75. Times, July 9, 1899; Journal, July 10, 1899.

76. Times, July 9, 1899.
77. Shreveport Water Works Company, "Schedule and Data," 1913, p. 46, and Shreveport Water and Sewerage Department, Drawing 26029 (January 7, 1905).
78. Shreveport Water Works Company, "Schedule and Data," 1913, p. 47, and Worley & Black, "Report," 1911, p. 18.
79. Shreveport Water Works Company, "Schedule and Data," 1913, p. 48, and Worley & Black, "Report," 1911, p. 18.
80. Shreveport Water Works Company, "Schedule and Data," 1913, p. 48, and Shreveport Water & Sewerage Department, Drawing 26242 (November 21, 1911).
81. The Caddo oil field with its large deposits of natural gas was discovered in 1905, and natural gas was introduced into Shreveport in 1906 (O'Pry, Chronicles of Shreveport, pp. 102-103). The Sanborn-Perris Map and Publishing Co., Insurance Maps of Shreveport, 1909, lists the fuel for the McNeil Street Station boilers as natural gas on the sheet which covers that area.
82. Irving H. Reynolds, "High Duty vs. Low Duty Pumping Engines," American Water Works Association, Proceedings, 1907, pp. 223-229 [Chester has extensive comments], and "Municipal Water-Works Pumping Engines," American Society of Civil Engineers, Transactions, v. 54 D (1905) pp. 554-561 [extensive Chester comments]. Also J.N. Chester, "High Duty vs. Low Duty Pumping Machinery from the Operator's Standpoint," American Water Works Association, Proceedings, 1908, pp. 723-755, and "Pumping Machinery -- Test Duty vs. Operating Results," American Water Works Association, Journal, v. 3 (1916) pp. 493-495. Surface rather than jet condensers were used with the Shreveport steam pumping engines for a similar reason -- lower maintenance costs (see the Chester comment in Reynolds, "Municipal Pumping Engines," pp. 557-558).
83. Shreveport Water Works Company, "Schedule and Data," 1913, pp. 46-47, for the installation record of AWWG in Shreveport between 1899 and 1911; also a number of the drawings in the Shreveport Water & Sewerage Department drawing collection contain some information.
84. Shreveport Water Works Company, "Schedule and Data," 1913, p. 46, and Shreveport Water & Sewerage Department, Drawings 2614 (November 31, 1900), 2615 (October 11, 1900), 2619 (November 1900), 2620 (October 9, 1900), 2622 (November 13, 1900), and 26162 (April 1900). A filter of the horizontal cylindrical variety is pictured in Leeds, "Water Purification," pp. 307, 313.
85. Shreveport Water Works Company, "Schedule and Data," 1913, p. 47, and Worley & Black, "Report," 1911, pp. 20, 51; also Shreveport Water & Sewerage Department, Drawing 26052 (February 18, 1904).
86. Stevens, "Pressure Filters," pp. 750-778 passum (discussion of paper).

87. Baker, Quest for Pure Water, p. 227; Wellington Donaldson, "Water Purification -- A Retrospect," American Water Works Association, Journal, v. 26 (1934) p. 1057; Johnson, Public Water Supplies, p. 48.
88. Shreveport Water Works Company, "Schedule and Data," 1913, p. 47; Worley & Black, "Report," 1911, pp. 19-20, 51; Shreveport Water & Sewerage Department, Drawings 26094 (April 15, 1908), 26165 (November 22, 1909) and 26170 (December 5, 1909).
89. Shreveport Water Works Company, "Schedule and Data," 1913, p. 48; Shreveport Water & Sewerage Department, Drawing 26181 (November 10, 1910).
90. Shreveport Water Works Company, "Schedule and Data," 1913, p. 46 (for 1901); Shreveport Water & Sewerage Department, Drawing 26077 (April 1907) and 26-272H (November 19, 1912).
91. Shreveport Water & Sewerage Department, Drawing 2622 (November 13, 1900).
92. William W. Hassler, "The History of Taste and Odor Control," American Water Works Association, Journal, v. 33 (1941) pp. 2125-2126. See also Baker, Quest for Pure Water, pp. 370-390, for history of aeration in America.
93. Shreveport Water Works Company, "Schedule and Data," 1913, p. 48. Coagulation and other chemical equipment are briefly described in Worley & Black, "Report," pp. 12-13, 20-21. Cypress tanks with bevel-gearred agitators were used to prepare chemical solutions for addition or injection into the purification system.
94. Shreveport Water Works Company, "Schedule and Data," 1913, p. 46, and Shreveport Water & Sewerage Department, Drawing 2608 (September 29, 1900).
95. Chester & Fleming, "Report," 1919, p. 8.
96. Baker, Quest for Pure Water, pp. 326-342; Hassler, "Taste and Odor Control," pp. 2130-2131.
97. Shreveport Water & Sewerage Department, Drawing 26242 (dated November 21, 1911) shows a "Bleach Room" attached to the southern wall of the McNeil Station between the boiler and coal rooms and the settling basins. It also appears in drawings 26243 (November 23, 1911) and 26241 (November 25, 1911). In addition a "hypochlorite room" is listed in the inventory of the Shreveport Water Works Company's plant in the Worley & Black "Report" of December 1911. The exact date of the initial use of hypochlorite in Shreveport's water system could not be established.
98. The advantages of liquid chlorine are reviewed in: "Data and Discussion on Relative Efficiency of Liquid Chlorine and Hypochlorite of Lime," Engineering and Contracting, v. 43 (1915) pp. 173-174.
99. Baker, Quest for Pure Water, pp. 341-342.

100. Fire and Water Engineering, v. 56 (1914) p. 423; Louisiana State Board of Health, Biennial Report, 1914-1915, p. 119. On the Wallace and Tiernan Chlorinator see Thomas L. Amiss, "Water Works Revenue Takes Care of Bond Issue for Improvements," Water Works Engineering, v. 83 (1930) p. 884.
101. Francis F. Longley, "Present Status of Disinfection of Water Supplies," American Water Works Association, Journal, v. 2 (1915) p. 680.
102. Shreveport Water & Sewerage Department, Drawing 26242 (November 21, 1911).
103. Longley, "Status of Disinfection," p. 680.
104. There is some evidence that American Water Works and Guarantee Company considered erecting a completely new pumping station in Shreveport. Shreveport Water & Sewerage Department, Drawing 2063 (August 25, 1899) contains a plan of the McNeil Station. To the northwest is a sketch of a plan for a new station, a 50 foot by 170 foot rectangular structure, with low and high service pumping rooms, a filter room, and a clear water basin under the filter room.
105. Shreveport Water Works Company, "Schedule and Data," 1913, p. 46. Additional details on some of these additions can be found in the 1911 Worley & Black "Report", which provides an item by item inventory of the McNeil plant, and Shreveport Water & Sewerage Department, Drawing 2622 (November 13, 1904).
106. Shreveport Water Works Company, "Schedule and Data," 1913, p. 47, and Worley & Black, "Report," 1911, pp. 11-12, 20.
107. For the deterioration of Cross Bayou see the report of J.A. Blanchard in the Shreveport City Council, Minutes, July 9, 1907.
108. Shreveport Water Works Company, "Schedule and Data," 1913, p. 45.
109. Veatch, Geology, p. 287.
110. Times, January 31, 1926 (address of Commissioner W.T. Mayo), and June 7, 1931 (comments by J.N. Chester), both mention a survey of Cross Lake c1898 by J.N. Chester, then field engineer for AWWG.
111. Shreveport Water Works Company, "Schedule and Data," 1913, pp. 112-113.
112. Ibid.
113. Ibid., p. 110, and Thomas L. Amiss, "History of Shreveport Water Department," South-West Waterworks Association Convention, Souvenir Booklet, p. 15, and "History of Shreveport Water Department," in O'Pry, Chronicles of Shreveport, p. 199.
114. Shreveport Water Works Company, "Schedule and Data," 1913, pp. 47, 104; Amiss, "History of Shreveport Water Department," in O'Pry, Chronicles of Shreveport, p. 199, and "History of Shreveport Water Department," South-West Water Works Association, Souvenir Booklet, pp. 15, 19.

115. Shreveport Water Works Company, "Schedule and Data," 1913, p. 47.
116. Ibid., p. 104.
117. Ibid., p. 47.
118. Ibid.
119. Amiss, "History of Shreveport Water Department," in O'Pry, Chronicles of Shreveport, p. 199.
120. Shreveport City Council, Minutes, August 3, 1909.
121. Shreveport Water Works Company, "Schedule and Data," 1913, p. 47; Worley & Black, "Report," 1911, p. 5; and Amiss, "History of Shreveport Water Department," in O'Pry, Chronicles of Shreveport, p. 199.
122. Shreveport City Council, Minutes, April 11 and April 25, 1911.
123. For details of the 1911 system see Shreveport Water Works Company, "Schedule and Data," 1913, p. 48; Worley & Black, "Report," 1911, pp. 14-17, 19; and Shreveport Water & Sewerage Department, Drawings 26213R (May 10, 1911), 26216 (May 11, 1911; revised September 11, 1911), 26225 (July 28, 1911; revised October 13, 1911), and 26231 (October 11, 1911). Also Amiss, "History of Shreveport Water Department," in O'Pry, Chronicles of Shreveport, pp. 199-200, and "History of Shreveport Water Department," South-West Water Works Association, Souvenir Booklet, p. 19.
124. Amiss, "History of Shreveport Water Department," in O'Pry, Chronicles of Shreveport, p. 200, says: "In 1912 upon the completion of the 30-inch syphon line, a brick circular pump well was constructed and five million g.p.d. Worthington Cross Compound was placed in it taking the place of the old two and one-half million g.p.d. incline pump." However, Shreveport Water Works Company, "Schedule and Data," 1913, p. 48, does not mention a new steam pump. Moreover, Shreveport Water & Sewerage Department, Drawings 26029 (January 7, 1905) and 26241 (November 25, 1911, showing the projected layout of the pump pit) seem to indicate that the incline pump was simply placed in the new pump pit, rather than replaced with a larger pump. Perhaps the water end of the old steam pump was replaced with a larger unit.
125. Shreveport Water Works Company, "Schedule and Data," 1913, p. 48, and Worley & Black, "Report," 1911, p. 5.
126. Louisiana State Board of Health, Biennial Report, 1910-1911, pt. 3, p. 144, noted, for instance, that the city's new water supply was bacteriologically pure, but hard with a "slight brackish taste, thus lowering its potable value." The 1912-1913 Biennial Report contained an analysis of Red River water and commented (following p. 177 and on p. 205) that while safe from a sanitary viewpoint, it was too heavy

in mineral matter to be considered potable. A November 1911 telegram from the State Board of Health informed the city's Chamber of Commerce that Red River water was acceptable from a sanitary point of view, but that mineral matter containing chlorides and sulphates made it hard and that these contents were too high to make it a good potable water (Chamber of Commerce, Board of Directors, Minutes, November 7, 1911).

127. Because there were always suspicions of the purity of Shreveport Water Works Company water for drinking and because the company's mains did not reach many areas of town, many of Shreveport's residents had long continued to depend on springs, wells, and cisterns. For instance, the Biennial Report of the Louisiana State Board of Health for 1900-1901, notes in pt. 3, p. 12: "we are still dependent on overground cisterns for domestic purposes." Moreover, the claim was made in 1911 that few people used the water of the water company except for bathing (Journal, July 7, 1911).
128. The data on mains comes from Baker, Manual, 1891, p. 182; Sanborn-Perris Map Co., Insurance Maps of Shreveport, August 1899; and Worley & Black, "Report," 1911, pp. 52-57.
129. Baker, Manual, 1891, p. 182; Sanborn-Perris Map Co., Insurance Maps of Shreveport, August 1899 and 1909 (with paste-in additions to 1916).
130. Baker, Manual, 1891, p. 182; Shreveport Water Works Company, "Schedule and Data," 1913, p. 50.
131. Shreveport City Council, Minutes, November 17, 1902, and Louisiana State Board of Health, Biennial Report, 1902-1903, pt. 3, pp. 17, 21-22. The city's Fire Chief in 1908 also complimented the company for extending its mains to keep pace with the growth of the city. He commented that the water pressure was "always good" ("Shreveport Grows as a Fire-Risk," Fire and Water Engineering, v. 43 [1908] p. 184).
132. Shreveport Progressive League, Shreveport of To-Day, September 1904, p. 47 (see also pp. 7-8).
133. Louis N. Brueggerhoff (publ.), Shreveport City Directory, 1906 (Shreveport, [1906]) p. 282.
134. Shreveport City Council, Minutes, August 3, 1909; Louisiana State Board of Health, Biennial Report, 1908-1909, pt. 3, p. 6.
135. Shreveport City Council, Minutes, September 10, 1907 (Witherell's Report).
136. Ibid., June 21, 1900, and June 28, 1900.
137. Ibid., October 4, 1900.
138. Ibid., December 13, 1900.

139. Ibid., April 15, 1901.
140. Ibid., May 2, 1901.
141. Ibid., November 6, 1902.
142. Ibid., November 11, 1902.
143. Ibid., November 17, 1902.
144. Ibid., February 27 and October 1, 1903.
145. Ibid., June 23 and July 11, 1905.
146. Ibid., November 17, 1905. This, however, did not completely clear up the matter, for litigation over water charges in Shreveport is noted in: "Water Litigation," Fire and Water Engineering, v. 44 (1908) p. 74.
147. Shreveport City Council, Minutes, July 11, 1905.
148. Ibid., May 9, 1905.
149. Ibid., November 19, 1906.
150. Ibid., January 14, 1907.
151. Blanchard's rather lengthy report is printed in ibid., July 9, 1907.
152. The typhoid death rate statistics are taken from the report of F.W. Witherell, a sanitary engineer. Witherell's report was printed in the Minutes of the Shreveport City Council for September 10, 1907.
153. Ibid.
154. Ibid., September 8, 1908.
155. Ibid., October 13, 1908.
156. Ibid., November 16, 1908.
157. Ibid., January 12, July 13, and August 3, 1909; Times, June 30, 1909.
158. Shreveport City Council, Minutes, August 3, 1909.
159. Ibid., August 3, 1909, and April 19, 1910, for example.
160. Ibid., November 14, 1910.
161. "The New Shreveport Water Supply," Fire and Water Engineering, v. 49 (1911) p. 277.
162. Shreveport City Council, Minutes, April 11 and April 25, 1911. The ordinance is also reprinted in Shreveport Water Works Company, "Schedule and Data," 1913, pp. 32-35.

Chapter III

PURE WATER AND LOTS OF IT:

The Struggle for Municipal Ownership (1911-1917)

INTRODUCTION

By 1910 relations between the Shreveport Water Works Company and the City of Shreveport had deteriorated to the point where it was clear that the city would probably not renew the company's franchise when it expired in the summer of 1917. In 1909 and 1910 the city had even begun to take steps to secure ownership of the bed of nearby Cross Lake for use as a reservoir for a future municipally owned water system and had secured the passage of a bill by the state legislature authorizing sale of the 11,000 acre bed of that lake to the city for the nominal price of \$1 per acre. [1]

The city's clear intention of doing something to improve the water supply situation was probably one of the primary factors which influenced the American Water Works Company's decision to construct the Red River syphon line in 1911. By tapping the Red River, the supply recommended by the city's own public health officer in 1907 [2] and by making a number of improvements at McNeill, AWWG may well have hoped to bridge the growing chasm between it and the city government and eventually to secure an extension of the franchise.

But, just as in 1901, the construction activities necessary to make these improvements led to temporary supply problems which only aggravated the raw nerves those activities were intended to soothe. In early June 1911, during modification work necessitated by the Red River syphon line, pressure in the water mains dropped and was inadequate at several fires. [3] These problems came on the heels of a report from the National Board of Fire Underwriters which indicated that a number of changes and additions were necessary for Shreveport's water system to be adequate for fire protection, changes which included the installation of new low and high service pumps, an additional boiler, and a fully metered distribution system. [4]

The Fire Underwriters' recommendations suggested that the plant of the Shreveport Water Works Company was inadequate for the city's fire protection needs, a primary concern of businessmen of the era. [5] The poor performance of the system in late May and early June seemed to confirm this diagnosis and proved to be the straw that broke the proverbial camel's back. While both the City Council and local newspapers had discussed the possibility of municipal ownership of the water system on a number of occasions, little had been done to carry through on the discussions. The campaign for municipal ownership that began in June 1911, following pressure problems in the mains, however, was to be a sustained drive and ultimately was to terminate the private water franchise in Shreveport.

THE CAMPAIGN BEGINS

The campaign for municipal ownership in Shreveport began on June 14, 1911. On that day the Shreveport Journal called the low pressure in the city's water mains a "serious menace." Somewhat cynically it warned the water company:

The people of Shreveport have not seemed to care about the quality furnished for drinking purposes, but now that property -- more precious than human life -- is menaced, it is possible the citizenship of the old town may be aroused. When the city gets mad enough it will have pure water and lots of it. [6]

That same day the Executive Committee of the Shreveport Chamber of Commerce, spokesman for the propertied interests of the city, met to discuss methods of securing "immediate relief" from the problems of low water pressure and high fire risk, inviting W.R. Goss, Superintendent of the McNeil Street Station, and Fire Chief Chris O'Brien. [7] O'Brien described the difficulties his department was having with water pressure. Goss, in response, blamed the problem on two factors -- the improvements being made by his company at McNeil and the drought being experienced by the city. He noted that the water company, in an attempt to increase water supplies, was making careful inspections for leaks. But he urged the city to reduce lawn sprinkling and persuaded the Chamber to ask the Mayor to limit sprinkling to one hour per day. [8]

The Chamber of Commerce's Executive Committee met again on June 19 to receive follow-up reports. Goss announced that with the restrictions imposed on sprinkling he was able to maintain a pressure of 60 psi in the mains, a statement confirmed by Fire Chief O'Brien. But this was too little, too late. Certain elements in the city were "aroused," and they had convinced the Chamber to call a public meeting for July 6, 1911, to discuss the water problem and the options open to the city. [9]

Shreveport had adopted the Commission form of government in 1910, replacing the weak mayor/council system which had governed the city since 1878. [10] The Commissioners of Public Utilities and Public Safety were present at the Chamber meeting and made it clear that they intended to investigate ways to more tightly control the water franchise, to purchase the existing system, or to build an entirely new system at the July 6 meeting. Commissioner of Public Safety, John Fullilove, for instance, cited the poor performance of the water company and declared that there seemed to him only one thing to do -- "take over that company's plant." [11]

In the two weeks between the Chamber's call for a public meeting on the water issue and the meeting itself, relations between city and franchise tumbled steadily downhill. The Council, on June 27, voted not to pay the city's water bill for June because of the inadequate pressure provided at the early June fires. [12] The Shreveport Water Works Company aggravated the situation by raising water rates for the majority of its consumers.

Rates to private consumers, it will be recalled, were flat rates, established by the 1886 franchise ordinance and based on the number of rooms in a house and the number of fixtures connected with the water and

sewerage systems. Due to lax inspections and the failure of consumers to report fixtures or rooms added since the initiation of service, many Shreveport water customers were, by 1911, paying rates lower than those specified in the franchise ordinance. Inspections carried out in June, perhaps in an attempt to detect leaks and improve pressure in the mains, apparently uncovered a number of these and eventually resulted in a "sudden and virtually wholesale" increase in water rates in the city. [13]

While this increase in water rates probably was justified, it was not a diplomatic time for such an action. The Times in early July noted that complaints were coming in "on all sides", and the Journal observed that "the citizens have been howling in good fashion." [14] The Times, in particular, was strongly opposed to the increased charges and demanded a thorough investigation:

It is outrageous for the water company to go about counting hallways and clothes closets to be used as a basis for higher charges when the water is fit only for sprinkling and for sewerage purposes.

Because the rate hikes had come so soon after the Council's decision to permit installation of the syphon line and the increased level of criticism against the company, it was regarded as "suspicious, to say the least." The Times suggested that the Shreveport Water Works Company was trying to make the people pay for the river intake or retaliating for the criticism of the low water pressure at recent fires. [15]

One good thing, however, did come out of the higher water rates -- increased metering of the system. Willful waste of water by customers on a flat rate (contributing to low water pressure) was a major problem of early water systems all over the country, a problem soluble only by metering. [16] Recognizing this, the Shreveport Water Works Company had attempted to make metering compulsory in 1905, but had been defeated by the "strenuous" objections of certain City Council members and by property owners with rent houses. [17] The increased charges which followed the 1911 inspections apparently convinced some that metering was cheaper than a high flat rate. Influenced by arguments that metered rates would be cheaper for most customers, would reduce wastage, and would allow the maintenance of better pressure in the mains, the Council on July 11 passed an ordinance allowing the water company to install meters where it wished, requiring the company to install meters if they were requested. [18]

The July 6, 1911, public meeting on the water question was "not largely attended," but there was a "representative crowd of business men, professional men, and others on hand." [19] E.K. Smith, President of the Shreveport Chamber of Commerce, chaired the gathering, announcing at its onset that the meeting, even though initiated by the Chamber, involved an issue far too broad and too important for the Chamber alone to deal with. Discussion was opened by J.R. Fullilove, the Commissioner of Public Safety, who offered for discussion a resolution requesting the City Council to employ an expert to estimate the cost of erecting a completely new water system, to estimate the value of the plant owned by the Shreveport Water Works Company, and to estimate the cost of extending the present system to care for the entire

city's needs. The Council was requested to use this data in negotiations with the franchise owners to obtain a purchase price on the water plant. Fullilove's resolution also declared that it was the sense of the meeting that the city should obtain ownership of a water system "sufficient for the present and future needs of the City . . . in the shortest possible time and that it is a matter of the greatest importance . . ." [20]

Following Fullilove, several other incumbent city commissioners, the Mayor, an ex-Mayor, and several other prominent citizens spoke, all critical of the performance of the water company, all arguing for municipal ownership. Discussion centered around Fullilove's resolution. Several amendments were offered, but defeated, and Fullilove's resolution was eventually passed with but one dissenting vote. [21]

The City Council met five days later, on July 11, 1911, and unanimously adopted the Fullilove resolution, appropriating \$1000 and authorizing the superintendent of the city's Department of Public Utilities to hire an engineer to appraise the Shreveport Water Works Company's plant and to estimate the cost of an entirely new plant. [22]

The city employed the firm of Worley & Black, of Kansas City, Missouri. This firm had its beginnings in the partnership of Ernest B. Black and J.S. Worley, graduates of the University of Kansas, and had established a national reputation as a consultant in the water utilities field. [23] In October and November 1911 Black visited and inspected the Shreveport Water Works Company's plant and made a detailed appraisal of its value, placing it at slightly under \$800,000. [24] His report was delivered to the city in December 1911. [25] With this document the city began negotiations with the Shreveport Water Works Company, but the two sides were unable to reach agreement. Finally, at the September 11, 1912, meeting of the Council, Fullilove moved to offer the company \$607,635.94 for its works. This figure was based on the estimate of Worley & Black, but did not include several items in that estimate which the city felt had no tangible value, such as 4.5% interest on investment to the end of the franchise period, the costs of paving streets over water and sewer mains if new mains were laid, and so on. Improvements made since November 24, 1911, the date of the Black and Worley appraisal were to be added to this figure. The Mayor was instructed to submit this offer to the water company and, if it were accepted, to order an election for a bond issue to purchase the plant and the bed of Cross Lake (the latter from the state). If the company refused the offer, the Mayor was instructed to submit a proposition for a bond issue to build a new municipal water and sewerage plant and purchase Cross Lake. [26]

The President of the Shreveport Water Works Company, A.M. Lynn, responded to the city's offer from Pittsburgh on the 27th of October. He noted that the franchise granted the company in 1886 provided a mechanism for the purchase of the plant by the city -- a board of appraisers. Both the city and the company were to appoint an engineer, and these two would choose a third. The three would jointly determine the value of the plant, and the verdict would be binding on both parties. Although this system was intended to be used at the expiration of the thirty year franchise, Lynn offered to waive that provision. [27]

The Council on October 29, 1912, accepted Lynn's suggestion and, not surprisingly, named the firm of Worley & Black as its representative. The Council, however, noted that no figure named by the Board of Appraisers could be considered binding on the city unless approved by the voters. The resolution accepting Lynn's suggestion passed the Council by only a 3 to 2 margin. Fullilove and McCullough, the two Commissioners most active and most outspoken at the June 19, 1911, Chamber of Commerce meeting and the July 6, 1911, public meeting, dissented, apparently feeling that the use of a board of appraisers would not be advantageous to the city. [28]

In the meantime the city elected to go ahead and seek authorization from the voters to issue bonds to purchase the bed of Cross Lake from the state. At the January 2, 1913, meeting of the Council a bond election was set for March 5, 1913. [29] The proposition to issue \$11,500 in bonds for the purchase of the bed of Cross Lake was just one of eight bonding propositions submitted to the voters. But it passed by a comfortable majority, largest among the eight propositions submitted. Louisiana bonding elections in 1911 (and for many years after) required for approval a majority of both the total vote and the total assessments cast. In the case of the Cross Lake bonds the vote was 475 (\$2,143,551) yes; 183 (\$1,276,610) no. [30]

Although, as the Times noted the next day, there was no immediate prospect for utilizing the land the city was preparing to purchase, [31] the Cross Lake bond election was a clear indication of the city's growing determination to assume control of its water supply system. A few months later the Times noted in an editorial: "one thing is certain, sentiment in the city is overwhelmingly favorable to municipal ownership of the water and sewerage systems." [32] Sentiment on the City Council was likewise strongly in favor of municipal ownership. In November of 1912 and January of 1913, for instance, the Council had informed representatives of the Chamber of Commerce who were pressing for construction of a new Market House that the water question had first priority and that they did not care to consider a bond issue for a market house until the city had had an opportunity to vote on a bond issue for municipal acquisition of the water system. [33]

Through early 1913 the three members of the Board of Appraisers independently reviewed the plant of the Shreveport Water Works Company. By October they were ready to meet and iron out differences. Black, the city's representative, however, warned the city that the resulting figure might be higher than it expected:

Since that estimate [the 1911 Worley & Black appraisal] was made the company has improved and extended its system considerably, and was just beginning its work when the first appraisal was made. It is on account of these extensions and improvements that our report will show a value in excess of the former report. [34]

It was initially anticipated that the results of the Board's deliberations would be publicly announced on October 21, 1913. But apparently strong disagreements among the three appraisers delayed matters. [35] Although the exact cause of the delay is not certain, it was probably due to Black's unsuccessful opposition to certain valuations of the other two members of the Board. [36]

The report was released on October 22. The value of the plant was set at \$1,354,273, more than \$500,000 above the value set by Worley & Black in 1911. Part of the increase was due to improvements made to the system since November 1911, when Black completed his initial report. But other additions made to the Worley & Black 1911 appraisal were more objectionable to the city. There was, for example, a \$136,000 tag placed by the Board on the "going value" of the plant, i.e., the value of the plant by virtue of the fact that it was an operating enterprise with customers already connected to its lines and an insured revenue. The city also objected to inclusion of the Twelve Mile Bayou dam, pumping station, and canal in the estimates, claiming that these had been largely abandoned and the city had no wish to purchase them. Likewise, local officials objected to the inclusion of \$87,000 in the estimate to cover engineering, supervisory, administrative, legal, and incidental expenses. [37]

The city was shocked by the high price tag. The Shreveport Journal called the \$1,354,000 tag placed on the water system "plumb out of sight," "beyond all comprehension," and "beyond all reason." [38] Mayor J.H. Eastham declared the appraisers' figure to be "largely in excess of the proper valuation." He noted that, under the agreement with the company, the Council was legally compelled to submit a proposition to issue bonds for the amount set by the Board of Appraisers. But, he added, if the Council were forced to do this he would urge it to submit simultaneously an additional proposition to issue bonds for the construction of an entirely new plant, advocating the latter and urging people to vote down the former. [39] The remainder of the City Council were unanimously opposed to accepting the appraisers' figure. Commissioner Fullilove, for instance, again urged the city to build a completely new water plant. [40] The Council was encouraged to consider this option seriously by E.B. Black, the city's representative on the Board of Appraisers. Black had remained in Shreveport after the report of the appraisers had been delivered to discuss the alternatives open to the city and, in discussion with the Council, he had indicated that Shreveport could probably build a new plant for around \$1,000,000, substantially less than the price of the existing plant. [41]

Although the Council had committed itself to calling a bond election on the figure set by the Board of Appraisers, it soon found a means for extracting itself from this predicament. The city's legal borrowing capacity was limited by state law to 10% of its tax assessments. The cost of the Shreveport Water Works Company set by the Board of Appraisers was approximately \$150,000 in excess of the amount of bonds the city could legally issue in October 1913. [42] In view of this and the widespread opposition to purchase at the appraised price, the Mayor on October 22, 1913, informed the Shreveport Water Works Company that the Council considered it a useless expense to call an election and that unless the company formally protested he would conclude that they accepted his view. There was no protest, and on February 10, 1914, the Council formally voted not to call an election on the issue. [43]

THE 1914 BOND ISSUE CAMPAIGN

The disappointing report of the Board of Appraisers stunned the advocates of municipal ownership for several months, and the issue lay dormant. [44] But in February 1914 the Council by a 4 to 1 vote requested the City

Attorney to prepare an ordinance calling for an election to determine if the city should issue \$1,000,000 in bonds, the proceeds to be used to extend an offer of \$1,000,000 for the existing water works or to build a new water and sewerage system for the city. The single negative vote was cast by C.G. Rives, Commissioner of Finance. But even his vote was not a vote against municipal ownership. Rives objected to the proposed ordinance on other grounds. He felt that it was not specific enough in defining what the money would be used for. He also felt that any bond issue should provide sufficient funds not only to purchase the existing system, but to extend water and sewerage service to the entire city and to prepare Cross Lake for use as a reservoir. The proposed issue, he feared, would not provide enough monies for these projects. [45] Despite Rives' objections, his fellow commissioners approved the ordinance on final reading on March 10, 1914, and set the election for April 15, 1914. [46]

Fearing that the opponents of municipal ownership might defeat the proposed bond issue, if allied with proponents who shared Rives' misgivings, the supporters of municipal ownership met on April 2, 1914, to reconsider the actions taken by the Council. At that meeting, chaired by Mayor Eastham, both Fullilove, who had introduced the bond ordinance, and Rives, who had opposed it, spoke. Rives carried the day. On the motion of Victor Grosjean, a committee of five was appointed to appear at the next meeting of the City Council and ask for postponement of the bond election to allow time for a "more intelligent" campaign on the issue. At the same time a committee of fifteen was appointed to publicize the advantages of municipal ownership among the city's taxpayers. [47]

The Council, meeting on April 7, 1914, received the committee of five appointed by the advocates of municipal ownership five days earlier and, as requested, voted to postpone the bond election to "give time for a more intelligent campaign for the bonds." [48]

On April 22, 1914, the committee of fifteen appointed to publicize the advantages of municipal ownership held their organizational meeting, with ten of the fifteen present. L.C. Bulkley, who had made the presentation for postponement before the City Council, was named chairman; Leon I. Kahn, secretary. The members of the newly-organized Waterworks Committee agreed to collect and publicize as much data as possible on the advantages of municipal ownership. [49]

To obtain solid information a letter was addressed from the Committee to the mayors of the 119 cities in the United States with a population of between 25,000 and 50,000 (Shreveport's approximate size). This letter requested information on how money had been raised to build a water system, the capacity of their plant, how the water system was managed, per capita consumption, water rates, revenues, and so on. Replies were received from roughly half of the cities, and the results published in pamphlet form. In the "Report of [the] Waterworks Committee," Bulkley argued that the city could afford to build its own works with a bond issue at a cost only about 50% more than it was already having to pay in hydrants and sewer rentals. He pointed out that municipal ownership would keep in Shreveport water revenues which were currently being taken out of the city. Bulkley also reported that the Committee's survey indicated that municipally owned plants charged lower rates than privately owned plants, both to large and small consumers. [50]

On July 14, 1914, the Council again scheduled a bond election. The new ordinance, however, differed in several significant respects from the earlier one and was tailored to meet Rives' objections. The new bond issue was set at \$1,200,000 instead of \$1,000,000. How these funds were to be spent was clearly spelled out. \$958,000 was to be used to purchase or construct a water and sewerage system for the city; \$190,000 was reserved for expanding the sewer system to certain designated territories in the city; \$52,000 was to be used for engineering, contingency, and other miscellaneous expenses. The new election was set for August 20, 1914. This ordinance was approved by the Council on a 5 to 0 vote. [51]

Opponents of the city's plans for securing control of the water system were largely mute through the first few years of the campaign for municipal ownership and only began to speak out after the Council's initial call for a bond election in the spring of 1914. In May, for example, they attempted to put the Chamber of Commerce on record in opposition to the suggested \$1,000,000 bond issue. But this failed when the City Council voided its initial call for a bond election. [52] Following the Council's second call for a bond election, however, opposition to municipal ownership quickly re-emerged. The Times on July 24 noted this and speculated as to whether this opposition was due to "gross ignorance" or "unexplained motives." The Times reported that those antagonistic to the Council's plans were attempting to secure proxies from women property holders in the city (Women property owners were entitled to vote in Louisiana bond elections and could vote either in person or by proxy). [53] Moreover, one of Shreveport's major papers, the Journal, announced on July 20 its opposition to the Council's plans, arguing that the terms of the franchise were very advantageous to the city, particularly in the sewerage area. The application of "common ordinary business principles and average business intelligence," the Journal declared, will persuade votes that the city has nothing to gain by municipal ownership. [54] The Journal complained that the Council had set August 20, 1914, as the date for the election because it knew that a large number of taxpayers would be out of town on vacation and that many of those remaining in town would be so busy due to the city's annual "Dollar Day" sale (scheduled for the same day), that they would not have the time or the opportunity to vote. [55]

Regarding the emergence of vocal, open opposition to the bond issue and to municipal ownership as a serious threat, the Waterworks Committee, established three months earlier to gather information on the advantages of municipal ownership, met on July 23. The Committee laid plans to solicit funds, to determine and publicize the positions of all candidates for city office on the bond issue, and to further advertize the advantages of municipal ownership. [56]

Throughout the month long campaign which followed the Council's July 14 call for a new bond election, Shreveport's morning paper, the Times, supported the cause of municipal ownership and passage of the bond issue; the evening paper, the Journal, opposed the bond issue. Both papers, and especially the Journal, however, opened up their columns to spokesmen from both sides of the issue.

Those favoring municipal ownership and the passage of the \$1,200,000 bond issue used public meetings, letters to the editor, and speeches before service

groups like the local Rotary Club to present their case. Bulkley and his allies during the campaign repeated many of the arguments initially presented in the "Report of [the] Waterworks Committee" a month earlier. They pointed out, for instance, that the \$45,000 which the city paid annually to the franchise for hydrant and sewer rental would in itself be nearly sufficient to cover interest payments on the bond issue, and that the \$109,000 profit made the previous year by the Shreveport Water Works Company should go into city rather than private coffers.

But other points were also raised. Proponents of municipal ownership reacted bitterly to past troubles with the water company. The private franchise was charged with placing "price first and people second, and sometimes third," with charging extortionate rates, with being arrogant and indifferent to the rights of the people and its charter duties. The private franchise was further criticized for delivering unattractive, unwholesome water, with providing inadequate pressure at fires, and with delaying the extension of mains into new subdivisions. Private water franchises were called civic blunders of the past, and the nationwide trend towards municipal ownership was used as an argument for municipal ownership in Shreveport. Finally, proponents of the bond issue argued that even if the city did not build a new and better water plant with the proceeds of the bond issue, the bonds would still serve a useful purpose. They would provide the city with a "club" for use during negotiations with the private franchise either over the terms of franchise renewal or over the purchase price of the existing works. They would put the city in a position to erect its own plant if satisfactory terms could not be extracted from the American Water Works and Guarantee Company. [57]

The proponents of municipal ownership enjoyed one major piece of luck during their campaign. The Red River, always treacherous, shifted course during the summer and carried away the outer section of the syphon line, forcing the water company to return to its old Cross Bayou intake while repairs were made. [58] The city's public health officer, G.C. Chandler, was not formally informed of this change, but when he found out he sharply criticized the company for using the "stagnant pond into which drains the filth of fully one-third of our city." [59] To make matters worse for the franchise, colon bacilli were detected in the water supply, and customers had to be urged to boil water from the mains before consuming it. [60]

Those antagonistic to the bond issue occasionally spoke before civic groups and used petition campaigns to publicize their position. But the Shreveport Journal served as the primary mouthpiece for the opposition, an opposition which included, according to the Journal, a substantial number of the city's most solid and substantial businessmen and citizens, people who paid a large share of the city's taxes. [61]

The opposition of many who opposed the bond issue was, no doubt, largely based on principle -- a deep-felt belief that private enterprise was the only workable system, even for water supply. They feared that publicly owned utilities could not be run efficiently because they could not attract good businessmen and because politics would inevitably interfere with

responsible management. Their response to complaints of the reluctance of the water company to expand its system was to argue that AWWG would quickly expand once given the assurance its franchise would be renewed. Before it had this assurance, it could not be expected to expand. The opponents of municipal ownership could not really excuse the poor quality of the water served and the occasional pressure problems of the system, but they generally felt emphasis should be placed on getting stronger contract guarantees under a new franchise agreement, instead of completely rejecting the franchise concept. [62]

Many who were antipathetic towards the bond issue feared that its passage would lead to the construction of a completely new water system, especially in view of the impasse in negotiations over price between AWWG and the city. This, they pointed out, would mean that the city's streets would be torn up, at taxpayers' expense, while new mains were installed. It would be "foolish," the Journal charged, to put another million dollars worth of pipe under the streets and build another water plant and intake, when a system already existed. [63]

Some opposition to the bond issue seems to have come from people who were not opposed to municipal ownership in principle, but who simply felt either that the time was not ripe or that the approach being taken by the Council and its supporters was wrong. These agreed with the outright opponents of municipal ownership that the city's financial position was not favorable. They pointed out that the \$1,200,000 bond issue would bring the city to within a few thousand dollars of the debt limit imposed by the state constitution. This would mean that even if the city bought the old plant or built a new one, there would be no funds available for expanding or bettering the system. This situation, it was pointed out, might be made worse if the city's bonds did not sell at par value, a distinct possibility since Shreveport still had \$82,000 in bonds from a previous issue that it had been unable to sell. This situation would lead to higher taxes or higher water rates than if the water supply were left in private hands. Some circles also felt that the franchise agreement had provided a means for the city to purchase the water system -- a board of appraisers. The Council, they argued, should abide by its word and either purchase the plant at the price the Board had named in 1913 or renew the franchise, instead of attempting to "club" the water company into allowing its property to be confiscated. [64]

The bond election of August 21, 1914, was the largest taxpayers vote in Shreveport's history [65] and culminated what the Times called "one of the most remarkable campaigns ever conducted in Shreveport." [66] The election was close. As noted previously, under Louisiana law only property taxpayers were allowed to vote in bond elections and passage required a majority of both the total vote and the total assessments cast. The final results (detailed in Table 11, next page) were:

580 votes, \$1,912,859 assessments for the bond issue
281 votes, \$1,721,583 assessments against the bond issue. [67]

While the proposition clearly was supported by the majority of the voters, the election was very close in assessments and was, in reality, even closer than the final tabulation indicated. Under Louisiana law women property

TABLE 11: ANALYSIS OF VOTE ON THE AUGUST 1914 WATER WORKS BOND ISSUE

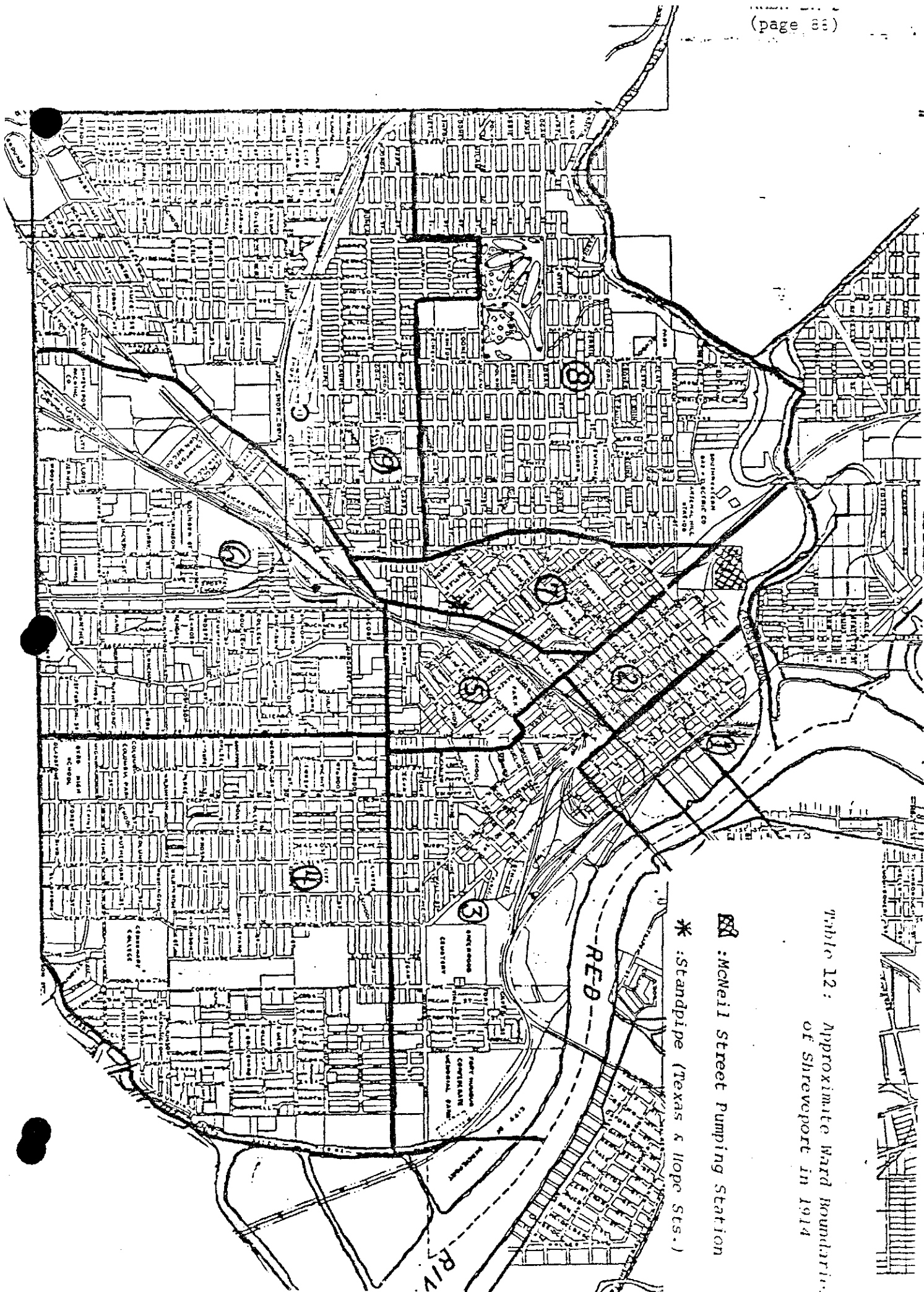
Ward	Location	Total Vote	Total Assmt.	Avg. Assmt.	Vote & Assmt. For	Vote & Assmt. Against	% Vote For	% Assmt. For
1.	Riverfront Downtown*	63	\$271,940	\$4317	43 (\$128,725)	20 (\$143,215)	68	47
2.	Downtown: Common- Edwards St. *	66	492,470	7462	35 (\$150,760)	31 (\$341,710)	53	31
3.	Riverfront; East Edge of City	82	345,570	4214	57 (\$191,060)	25 (\$154,510)	70	55
4.	Extreme Southeast**	164	580,505	3540	118 (\$391,365)	46 (\$189,140)	72	67
5.	Central City and (Immediately East of Texas and Hope)*	53	425,195	8023	27 (\$109,220)	26 (\$315,975)	51	26
6.	Extreme South ** (South central part of city)	153	796,216	5204	103 (\$523,804)	50 (\$272,412)	67	66
7.	Central (Standpipe)*	69	251,110	3639	47 (\$107,795)	22 (\$143,315)	68	43
8.	Northwest	79	258,971	3278	56 (\$160,465)	23 (\$98,506)	71	62
9.	Extreme Southwest **	132	215,462	1632	94 (\$149,662)	38 (\$65,800)	71	69
TOTALS		861	\$3,634,442	\$4221	580 (\$1,912,859)	281 (\$1,721,583)	67	53

Avg. Assmt. \$3298 Avg. Assmt. \$6126

* : Near pumping station or standpipe; water pressures likely to be good.

** : At extreme limits of the city and distant from pumping station and standpipe; pressures likely to be poor; sewer and water mains may not extend into the area or service the area well.

assmt. = assessment



taxpayers could vote either in person or by proxy. Most women chose the latter option, but in this election, as in other elections, the men voting their proxies often spoiled the ballots, usually because they signed only their own name and not the name of the person whose proxy they were voting. The Journal noted that there were a number of cases where proxies (some valued in the neighborhood of \$50,000) could not be counted officially because the ballots were spoiled and indicated that more of the spoiled ballots were cast against the bond issue than for it. Moreover, the widow of Peter Youree, the former owner of the water franchise who had died just a few weeks earlier, cast an assessment of \$150,000 against the bond issue. This ballot was invalidated because the estate had not yet been settled, and Mrs. Youree was thus not credited with the assessment on the tax rolls. [68] With these additions to the "no" side of the ballot, the assessments cast against the bond issue would have come to within a few thousand dollars of the assessments cast for it.

Table 11, which details the results of the August 20, 1914, bond election also gives a good indication of some of the factors which influenced the voters. For example, opposition to the issue was strongest in several of the wards near the pumping station or the standpipe where water pressures were high, water and sewer mains abundant, and service probably good (see map of Table 12). In the downtown area, bounded by Common and Edwards streets, only 53% of the voters favored the bond issue, and in Ward 5, the central part of the city, near the standpipe, only 51% of the voters favored it. The issue carried by the widest margins in Wards 4, 8, and 9. Two of these Wards (4 and 9) were quite distant from the pumping station and standpipe and either had poor pressure, or, because water and sewer lines had not been extended throughout these areas, none at all. These were the wards, moreover, where the bulk of the sewer extensions promised in the bond ordinance were to be laid.

While geography and the level of existing service influenced voting on the 1914 bond issue, financial factors were even more important. The results of the election confirmed the Journal's contention that the opposition to the bond issue was strong among the city's larger businessmen and most substantial citizens. The average property assessments cast were highest in Wards 2 and 5, the two wards with the strongest vote against the bond issue both in terms of percentage of "no" votes and in terms of percentage of property assessments cast against the issue. In Ward 5, with an average assessment of \$8023, only 51% of those voting favored the bond ordinance and only 26% of the property assessments were cast in its favor. In Ward 2 the average assessment was \$7642. Only 53% of the voters favored the issue, and only 31% of the property assessments were cast for it. On the other hand, over 71% of the voters in Ward 9, the ward with the lowest average assessment cast (\$1632), supported the bond issue, casting 69% of the property assessments for it. For the city as a whole, the average property holder voting for the bond issue had an assessment of only \$3298, while the average property holder voting against the issue had an assessment of \$6126.

There was, of course, a relation between the areas provided with good service and wealth. The wealthy lived in areas relatively well serviced by the water company and, when necessary, were able to secure the necessary

service extensions, for they had sufficient service connections to make sewer and water main expansion profitable. [69] There were a number of other factors which probably contributed to the opposition of Shreveport's wealthiest citizens to the bond issue beyond those raised during the campaign and beyond the high level of service they enjoyed. Wealthier households probably depended on water from the Shreveport Water Works Company only for fire protection, lawn sprinkling, washing, and flushing. For drinking they purchased relatively expensive bottled spring water. [70] Hence they were not as concerned about the hardness, color, or taste of the water provided by the water company as were the lower classes who either depended, or wished to depend, on the water works for drinking water as well as sprinkling, flushing, and bathing water. The benefits the wealthy would derive from municipal ownership (except in the area of fire protection) were not at all clear, and it is quite likely that they, therefore, saw no reason why their property taxes should subsidize water for the entire city.

Shortly after the election several property owners protested the validity of the bond election in the courts, not surprising in view of its closeness and the large number of voided ballots. But their hopes were squashed in early 1915 when Judge J.R. Land denied their petition to annul the results of the August election. [71] The case was appealed to the Louisiana Supreme Court, but in June 1915 it affirmed Land's decision. [72]

USING THE CLUB

The August 1914 election and the courts' refusal to nullify its results ended serious opposition to municipal ownership in Shreveport. The question now was not whether or not the water system would eventually become municipally owned, but whether the municipally owned water works would be built from scratch or whether the McNeil Street Station and its associated water distribution system would be purchased from the American Water Works and Guarantee Company.

With the "club" handed them by the August 1914 election, the City Council quickly took a harsher line in relations with the Shreveport Water Works Company. On December 8, 1914, the Council passed an ordinance prohibiting the water company from installing water meters without the consent of consumers, in effect repealing the 1912 ordinance which had permitted metering of the system. [73] The Shreveport Water Works Company in early 1915 instituted a test suit to contest the repeal of the 1912 meter ordinance, but, at the same time, perhaps in an attempt to cool things down, reduced the minimum charge for automatic sprinklers from \$50 to \$35 per year. [74]

After the Louisiana Supreme Court had upheld the validity of the August 1914 bond election, AWWG president A.M. Lynn attempted to force the issue. In August 1915 he asked the Council to either pay \$1,415,000 for the franchise (the price set by the Board of Appraisers [\$1,354,273] plus extensions and improvements since the date of the appraisal) or renew the franchise. Lynn argued:

We beg to suggest, respectfully, that the city is morally bound to take the property of this Company at their fair and reasonable market value, rather than construct new plants, because

Fresh from victories at the polls and in the courts, Lynn's suggestion was not favorably received. The copy of Lynn's letter in the Minutes of the City Council is abruptly terminated after the word "because" (see above). The transcript of the letter is crossed out, and under the letter is the notation:

By instruction of Mr. Ward, the foregoing was stricken from the minutes, and the Auditor instructed to make notation of the documents presented by Shreveport Water Works Co. [75]

The Times reported the following day that the company had offered some concessions to secure an extension of its franchise for an additional thirty years. The concessions were modest, but valuable. The Shreveport Water Works Company would assume the cost of installing service pipe connections up to and including the curb cock and curb box (previously cock and box had been paid for by the consumer); the \$3000 annual payment on the syphon line was to be discontinued; and charges for both public and private hydrants were to be reduced (from \$50 to \$40 per year on public hydrants, reducing the city's annual bill by around \$1000). AWWG made it clear that it regarded the Red River as the city's logical source of water supply and offered to consider installation of a softening plant. But, the company noted, softening was still in its infancy in large scale plants, and softened water would require new arrangements with a new rate schedule. Finally, the company insisted that any new franchise agreement permit complete metering of the system.[76]

Had these concessions come earlier, they might have been sufficient to defeat the August 1914 bond issue. But at this point they were useless. The chairman of the Waterworks Committee, Bulkley, called Lynn's offer "a joke" which "made eveybody laugh," and he asserted that Shreveport could have a new water works and sewer system with all the modern improvements, including a water softening plant, for less than \$1,400,000. [77] The City Council on September 2, 1915, formally answered Lynn's letter. AWWG's offer was rejected, and Lynn was informed that the Council would "refuse to consider a recommendation to the people of any extension of your franchise." [78]

The Council, instead, made a counter-offer of \$750,000 for the McNeil plant and its associated distribution system. This offer was based on the recommendation of John B. Hawley, a consulting engineer from Ft. Worth, Texas. Hawley had been retained by the city following the August 1914 bond election to compare previous appraisals of the plant and advise the Council on its fair value, apparently in preparation for making a formal offer. Hawley's report, delivered to the Council on September 2, 1915, a few days after AWWG's request for a franchise extension, was not made public, but apparently set the value of the plant slightly above \$750,000. [79] The management of American Water Works and Guarantee, however, probably regarded the \$750,000 offer as a direct slap in the face. Not only was this far below the valuation established by the Board of Appraisers, but in April 1914 the city had been prepared to offer \$1,000,000 for the

plant, and the bond issue of August 1914 had reserved \$958,000 for use in securing a water system for the city.

No one was surprised when the Council's offer was rejected by Lynn. He responded by demanding that the Council either submit to the voters the question of whether or not the city should buy the franchise at the amount set by the Board of Appraisers, or resubmit the case to a new Board of Appraisers with both sides, this time, being bound by the results. [80]

The City Council, instead, ordered a special election for November 4, 1915, to seek approval for using the \$1,200,000 in bonds to construct a completely new water and sewerage system. Although the Mayor noted that adoption of this resolution would mean that the city was burning its bridges, the motion passed unanimously 5 to 0. [81]

As Bulkley and the proponents of municipal ownership had argued, the passage of the \$1,200,000 bond issue had put a powerful club in the city's hands. If the voters decided to build a new plant, the city would not be compelled to pay a cent for the Shreveport Water Works Company's McNeil Street Station and its associated distribution and intake systems when the franchise expired in 1917. It would have junk value only.

In the August 1914 election, the Shreveport Water Works Company had remained, openly at least, on the sidelines, publicly supporting neither the proponents nor the opponents of the \$1,200,000 bond issue. The Council's more bellicose attitude and its clear determination to build a new plant rather than purchase the old one belatedly brought the Shreveport Water Works Company into the city's political arena. In the weeks preceding the November 4 referendum it placed large ads in local papers arguing that if the city constructed a new water and sewer system, paved streets would be ruined, water users would be compelled to install new connections at a cost of \$50 per building, and taxes would be increased. The Company pointed out that the purchase of the existing plant would give the city a water system immediately, without the two to three year delay construction of a new plant would entail. A fair price, the water company suggested, could be set by a local court and jury, if the method previously used for appraisal was considered unfair. [82]

The Waterworks Committee replied with large ads of its own, refuting the arguments of the water company. The Committee and its supporters argued that a new municipal system would provide better water and more water at lower rates. [83] A short time before the election Bulkley even charged that the water currently being delivered by the Shreveport Water Works Company was overdosed with alum. Although this charge was refuted by the State Board of Health, it may have had the desired effect. [84]

The turn out was heavy on November 4, 1915, [85] much heavier than at the bond election of August 1914 because no property qualifications were required since the bonds to be used to finance the new plant had already been approved. The result was a landslide victory for those who advocated construction of a new water system (see Table 13). They carried every ward in the city by a large majority, drawing 1558 votes, to only 268 for the opposition. [86]

TABLE 13 : Results of November 5, 1915,
Referendum on Construction of a
New Water Works System

		YES	NO	NO VOTES IN 1914
WARD		<u>121</u>	<u>18</u>	<u>(20)</u>
1.	Downtown: Riverfront			
2.	Downtown: Common-Edwards St.	201	21	(31)
3.	Riverfront: East Edge of City	137	30	(25)
4.	Extreme Southeast	233	45	(46)
5.	Central City: East	77	27	(26)
6.	Extreme South	230	61	(50)
7.	Central City: West	157	19	(22)
8.	Northwest	116	20	(23)
9.	Extreme Southwest	<u>286</u>	<u>27</u>	<u>(38)</u>
	TOTALS	1558	268	(281)

Although it cannot definitely be determined, it is highly probable that most of the increased "yes" vote in the November 1915 referendum came from non-property holders, while the city's largest property holders remained rather solid against the Council's plans. In August 1914 there had been 251 votes against the bond issue; in November 1915 there were 268 votes against constructing a new water system. And in almost every ward the vote against constructing a new water works ran very close to the vote against the bond issue.

The aftermath of the 1915 referendum was similar in many respects to the aftermath of the 1914 bond election. Several Shreveport property owners again filed suit in court (they were considered to be nominal plaintiffs representing the Shreveport Water Works Company), attempting to prevent the sale of bonds for use in the construction of the new plant, either in hopes of actually winning the case, or, more likely, merely to scare away potential bond purchasers. [87] But the tactic failed. By early February the city's position had been upheld in court, and the sale of the bonds was proceeding well. [88]

Also, just as after the 1914 election, the Council took a steamer line against the Shreveport Water Works Company. Beginning on January 1, 1916, the city withheld payment of its hydrant and sewerage rentals. On March 14, 1916, the Council formally instructed the city's Secretary-Treasurer to withhold these payments, charging that the Shreveport Water Works Company had failed to extend water mains down Wilkinson Street, even though it had been asked to do so more than three months earlier. Further, the Council authorized the Commissioner of Streets and Parks to contract for laying these mains on his own. [89]

The Shreveport Water Works Company could probably have prevented the city from connecting the new lines to the existing system when they were completed in July. The water company, however, did not wish to permanently antagonize the Council and destroy all hopes of selling its plant at the expiration of the franchise. Thus it notified the city that it would permit connection provided the city recognized that this did not imply, on the company's part, a concession of the right of the city to contract for new mains at the cost of the company or to retain payments due the company for water and sewer rentals, and provided the company was entitled to charge regular rates for water furnished to private consumers through these mains. [90] These conditions were accepted by the Council. [91] It was well they were, for in August the city's attorney notified the Council that its actions had been illegal. He pointed out that the franchise agreement required the Council to pass a formal resolution when extensions were requested. Since the Council had never passed a formal resolution requiring extension of mains down Wilkinson Street, the water company had not violated the charter and the city was unjustified in its actions. [92]

Even after calling for a referendum to approve construction of a new plant, city officials did not really expect to have to build one. The referendum was seen as a method of getting across to the Shreveport Water Works Company that it had to either sell out on the city's terms or get out when the franchise expired. [93] When the impasse continued even after the Council's victory at the polls in November 1915, the Council was forced to begin actually planning for a new plant, despite warnings from other cities that this was a more expensive option. [94] Thus, in February 1916 the

city acquired an option for the purchase of the "Currie Tract," a 13 acre plot opposite Hamilton Terrace on Louisiana Avenue in the eastern part of the city. Preliminary plans were to bring water to this site by syphon line from the Red River and soften it, as well as settle and filter it, before delivery in new city water mains. [95] A month later the Council authorized the Mayor to contract with John B. Hawley for designing and supervising the construction of both a water works and sewerage system for the city at a fee of 4.5% of actual cost. [96] A few days later three rooms were arranged for Hawley's use in City Hall. City officials announced that when the city's new water and sewerage plants were operable, these rooms would be used to house their offices. [97]

By August 1916 Hawley had completed his preliminary design work and surveys. His plans called for a plant of 6 mgd capacity, with provisions for increasing plant capacity as the city's water demands grew. The new plant was to include water softening facilities, since one of the primary complaints against the Shreveport Water Works Company's water since 1911 had been its hardness. The location of the new plant was not specified. After surveying the Currie tract, Hawley was convinced that it was not suitable. [98] He favored, instead, Douglas Island, on the north side of Cross Bayou. [99] With a complete set of specifications and drawings in hand the City Council on August 8, 1916, authorized the Secretary-Treasurer to advertise for bids on the proposed main pumping and water treatment facilities. Bids for the presedimentation basins, clear water reservoirs, mixing chambers, sedimentation basins, buildings, filtration and softening apparatus, and associated work outside the buildings were to be opened on September 5, 1916, with presentation to the City Council scheduled for September 16. [100]

Recognizing that if the city did go ahead with the construction of new pumping, filtering, and softening facilities, the McNeil Street Station would be almost valueless when its franchise expired in less than a year, the American Water Works and Guarantee Company was forced to take action. In early September the President of the Shreveport Water Works Company, A.M. Lynn, offered the city the properties owned by AWWG in Shreveport for \$1,000,000, almost a half million dollars less than had been demanded a year previously. [101] But the Council, realizing that they now had the upper hand, rejected the offer and countered with an offer of \$750,000 plus \$50,000 if the facilities were delivered within ninety days. [102]

Although this was practically the offer rejected a year earlier by the American Water Works and Guarantee Company, the situation had changed considerably. Since the city had demonstrated that it was ready to construct a new plant, AWWG was faced with a "take it or leave it" situation. Lynn and his associates decided to take it, but sought a few concessions. AWWG asked to keep company owned lands outside the city limits, to be paid for all material and supplies on hand at the plant, and to be allowed to operate the plant until March 1, 1917, the date that \$600,000 in bonds it had taken out on the Shreveport Water Works fell due. [103]

The City Council, however, was in no mood to make concessions. At a conference with Lynn on September 15, 1916, the Council refused to make any major concessions, and the Shreveport Water Works Company was forced to agree

to a delivery date of January 1, 1917, although the city did promise to help the company collect its earnings until then. [104] On September 16, 1916, the Council received a short, curt note from A.M. Lynn formally accepting the city's offer. [105] The formal ordinance (no. 45 of 1916) approving acquisition passed first reading at the September 18 Council meeting and final reading on September 26. [106]

The sudden offer from the Shreveport Water Works Company, however, placed the city in an embarrassing position. At the same meeting the Council received Lynn's acceptance of their offer of \$800,000, Hawley presented a detailed report on the bids opened September 5 for the presedimentation basins, clear water reservoirs, mixing chambers, sedimentation basins, buildings, and filtration and softening plants of the planned new water works. The motion to accept the bids recommended by Hawley on these facilities passed by a 3 to 2 vote. [107] Thus the city was in the position of both buying the old plant and building a new one. The continued support for a new plant was at least partially due to a desire for soft water, something the new plant was to supply but the old plant could not. Moreover, after the long campaign against the Shreveport Water Works Company some Council members clearly believed that the McNeil Street Station was as antiquated and obsolete as campaign rhetoric had made it. [108]

Mayor John McW. Ford and Commissioner of Public Utilities Leon Kahn urged the Council to go slow in the matter of building a new plant and cast the two dissenting votes. They, too, favored "good soft water." But they argued that city finances did not justify the city having two plants, and they urged their associates to wait a few years before insisting on soft water or at least see if additions to the old plant could provide it cheaper. [109]

Shreveport clearly did not have sufficient funds to both build a new plant and buy the old one. Thus on October 10, 1916, the Council called for a referendum to approve the purchase of the assets of the Shreveport Water Works Company, scheduling it for November 14. [110] Several factors seem to have convinced the Council on this course of action. In the first place, local bond experts considered the election a legal necessity to consummate the purchase, especially in view of the November 1915 referendum which had approved the use of the bond money for constructing a new plant instead. [111] Moreover, members of the Council who had continued to push for a completely new plant encountered a rising tide of opposition from voters who felt that since the old plant was available at a good price, it should be purchased. Among these was L.C. Bulkley, who had headed the city's "Waterworks Committee." [112] Supporters of purchase presented a petition signed by 806 voters to the Council at its October 10 meeting, with the intention of forcing a referendum on the issue if the Council did not act. [113]

Prior to Lynn's acceptance of the Council's offer of \$800,000 for the plant there had been considerable rhetoric to the effect that the McNeil Station was obsolete and the city should not even consider purchase. But practically all opposition to the purchase evaporated before the November 1916 election. When the ballots were counted 456 had voted in favor of the purchase of the McNeil Street Station and its distribution system (and the sewerage system) by the city, only 16 had voted against it. [114]

Although there were some technical and legal difficulties encountered during the transfer of ownership on December 31, 1916, they were quickly resolved. [115] The City of Shreveport assumed control of Shreveport's water system on January 1, 1917. The era of private ownership was at an end.

THE PRIVATE FRANCHISE AND THE CITY

As we have seen, between 1887 and 1917 conflicts between the holders of Shreveport's water franchise and the city's governing body were frequent and culminated with the City Council refusing to renew the franchise and forcing the private company to sell its works to the city for a sum probably under its actual value. This was not an unusual scenerio in this period. All over the nation urban reformers were attempting to bring water companies, as well as other public utilities, under tighter control, if not under outright municipal ownership. [116] The factors behind this movement were, in many cases, identical to those which poisoned city-franchise relations in Shreveport.

For example, one of the charges most frequently made against privately owned water systems was that they responded only to the interests of their stockholders and thus sought to extract the greatest possible profit with the cheapest possible equipment and the least possible service, that they milked their cities for all they could extract. Mayor S.A. Dickson made this accusation against the Shreveport Water Works Company on the eve of the 1914 bond election:

It [Shreveport] today has the opportunity to rid itself of a corporation which has sucked it for twenty-five years. . . . There are a thousand reasons and every one of them good, why Shreveport should vote today to emancipate itself from the water monopoly and not one reason why it should continue to permit itself to be sucked by such a concern . . . [117]

And even the usually sympathetic Shreveport Journal in early 1917 declared that private water companies' attempt to secure maximum profit with minimum service was wrong. [118]

This charge was repeated in one form or another by other spokesmen during the 1914 and 1915 elections. In some cities -- New York, Memphis, Atlanta -- this did happen. [119] But for Shreveport this charge provides, at best, only a partial and inadequate explanation of a very complex situation. The Bullock Company may have attempted to "suck" all it could from Shreveport in the 1887-1889 period, but the American Water Works and Guarantee Company's policies were more benevolent. Particularly during the first dozen years of its tenure at McNeil, AWWG made a large number of major improvements in plant and service designed to meet as many city demands as possible. The machinery AWWG installed was, if not first class, close to it, and was quite appropriate for the job expected of it. The rates the company charged were not excessive. As Table 14 on the following page indicates, the prices charged by the Shreveport Water Works Company were

higher than the national average, but not terribly so. And these rates were not set by the company, but were fixed by the 1886 franchise ordinance. Neither was AWWG's return on investment overly excessive. The company's profits were \$81,600 in 1911 and \$109,000 in 1913. [120] It was valued at \$800,000 in 1911 by Worley & Black and \$1,350,000 in 1913 by the Board of Appraisers. This gives a rate of return on investment of between 8 and 10.2%, not excessive for the period. Thus exploitation by a profit-hungry private corporation does not provide a complete and sufficient explanation for the consistently poor city-franchise relations in Shreveport.

Table 14. Rates Charged for Water by Private and Municipal Water Plants c1910

	Rate in 237 cities	Rate of 75 pvt. companies	Rate of 162 mun. companies	SHREVEPORT WW Co.
Family, 6 room house, hot & cold water at sink *	\$6.40	\$7.06	\$6.05	\$8.00
Family, 6 room house, bath, water closet, wash stand, sinks*	14.09	15.75	13.34	16.00
Maximum rate per 1000 gallons, metered	.23	.30	.20	.25 - .30**

*: annual rates

** : 0.25 after July 1912; 0.30 before

Sources: Frank C. Jordan, "Some Water-Works Statistics," New England Water Works Association, Journal, v. 24 (1910) p. 605; for Shreveport rates, Shreveport City Council, Minutes, July 11, 1912, and August 12, 1886.

A factor which was probably more important and was clearly inherent in the franchise system was the limited life of franchises. This complicated matters, particularly during the closing years of private ownership. As franchises approached their expiration date, the owners of the franchises were reluctant to invest capital in their systems, either for maintenance, the replacement of antiquated equipment, or expansions, reasoning that there would never be a reasonable return on such investments before the franchise expired. But this was a "Catch 22" proposition. The franchise holder's reluctance to make expansions and betterments during the closing years of the franchise, when renewal was under consideration, led to increased complaints about the quality of service and practically insured nonrenewal of the franchise.

The Shreveport Water Works Company definitely fell into this bind. After the improvements associated with the Red River syphon in 1911-1912, no major additions or modifications were made at the McNeil Station. No new filters, steam pumping engines, boilers, or structures were added to the complex. This alone would have placed the private franchise in a bad light. But making matters worse was the report of the National Board of Fire Underwriters in 1911 which contained a number of recommendations for improving Shreveport's water system. These recommendations, if followed, would have cost the Shreveport Water Works Company almost \$200,000, and the company was

clearly reluctant to make them with only five to six years of the franchise's life remaining. The quandry that this put the water company in was recognized by the advocates of municipal ownership and used with effectiveness in their campaign rhetoric. [121]

Had the Shreveport Water Works Company been given some assurance of franchise extension, it would likely have made some of the improvements recommended by the National Board of Fire Underwriters, as well as some of the improvements and expansions desired by its local critics. At least one of the local papers, the Journal, was convinced of this. It reported in 1914, for example, that the water company would extend its mains to the suburbs within two weeks after being assured of a renewal of its franchise. [122]

Even without a franchise renewal, the water company might have had less hesitation in investing further capital in the system if it had been provided with some assurance that the plant would be purchased by the city at a fair price at the expiration of the franchise. But the city's reaction to the 1913 valuation of the Board of Appraisers certainly gave no such assurance. Moreover, other private franchises in other cities had been practically expropriated by municipal governments. [123] AWWG's reluctance to invest in the system after 1912 was, therefore, justified in part. That its policy was a wise one is evidenced by the ultimate fate of the Shreveport water and sewerage system. Although valued at over \$1,300,000 by an independent Board of Appraisers in 1913, the city forced AWWG to sell the systems for \$800,000 in 1916 when the plant, due to a number of minor additions and betterments, probably had a value of nearly \$1,500,000.

City growth and rising standards of living further complicated life for private water companies and often made their relations with city governments difficult. [124] In Shreveport the 1886 franchise had designated Cross Bayou as the source of supply. During the early years of the McNeil Station this supply was adequate both in terms of quantity and quality (if properly treated). But, as we have noted, by the turn-of-the-century Cross Bayou had begun to deteriorate. Moreover, due to silting and increased water demand, especially as water closets and other fixtures became more widely used, the quantity of water in the Bayou was no longer sufficient during summer months. This placed the franchise owner in the position of either spending large sums of money to seek out and develop new supplies when the franchise had only half its life left, or continuing to use the designated supplies in the face of rising complaints and resentment. Hesitation and reluctance were only natural responses for the franchise agent in Shreveport. Eventually arrangements were made to tap other supplies, but only after public resentment had been aroused and city-franchise relations had been permanently damaged.

The profit-rather-than-service orientation of private companies, the limited life of private franchises, and slow response to city growth contributed to poor city-franchise relations. These relations were further poisoned by the problem of divided responsibility. City government was ultimately responsible for public health and fire protection. Yet water,

an essential element to both of these functions, was the responsibility of the private corporation. If service was not good the city often had to pay a heavy price. Fires raised insurance rates; epidemics stunted city growth and made it difficult to attract new industries. [125] Moreover, if there were deficiencies in the water supply that the private company was unable to correct immediately the City Council was invariably brought into the conflict. Voters expected the Council to take action, even though provisions in the franchise contract often placed the matter beyond its immediate control. These problems made city councils intolerant of private companies' difficulties in servicing certain areas economically or tapping pure water supplies or always maintaining service at a high level. In Shreveport this was certainly one of the factors complicating relations between the franchise and the City Council. In 1908, for instance, out-going Mayor E.R. Bernstein declared: "Compared with [Shreveport's] public health, adequate service cost should not be considered, nor distance to the supply Fountain a deterring factor." Only a municipally owned water system, he believed, would always be willing to help the Council meet its responsibility for insuring a healthy city by providing an adequate supply of pure water. [126]

Another factor which may have contributed to the poor relations between the Shreveport Water Works Company and the City Council was the magnitude of the city's annual water bill. In 1902 hydrant and sewer rentals alone consumed nearly 40% of the revenue the city derived from its property taxes. [127] While this percentage declined slightly in later years, the bill remained high for poorly financed Southern city governments like Shreveport's. In 1911 the city's water and sewerage bill was \$40,000, and in 1914 it was \$45,000. [128] It was only natural that the City Council would seek to secure greater control over a service which absorbed such a high proportion of its budget.

A change in the form of Shreveport's city government may also have had an influence on declining company-city relations, particularly after 1910. Between 1878 and 1910 Shreveport had a mayor-council form of government. In 1910 it adopted the commission system, a form extremely popular in larger urban areas in the early twentieth century. [129] The close coincidence of the adoption of the commission form of government and the initiation of the sustained drive for municipal ownership are probably related. Advocates of the new form of government and the first administration elected under it were probably anxious to prove its advantages. What better way was there than to take firm steps towards solving the city's perennial water problem? Moreover, the commission form of government gave at least one of the members of the City Council, the Commissioner of Public Utilities, a vested interest in municipal ownership of the water and sewerage systems. Acquisition of these systems would significantly increase his responsibilities and powers.

The extremely aggressive rhetoric of the first Mayor and Commissioner of Public Utilities under the new form of government in Shreveport seems to support this assumption. For example, Mayor John Eastham in his inaugural message in November of 1910 called the water situation "unbearable" and made its solution one of the priorities of his administration. [130] John

McCullough, the first Commissioner of Public Utilities, claimed on several occasions that his administration was the only one ever to take positive action to improve the water situation, first by approving the construction of a new intake (the Red River syphon), then by withholding hydrant rentals (in June 1911). [131]

City growth, the profit-rather-than-service orientation of private water companies, the limited life of franchises, and the problems of divided responsibility were matters that almost universally aggravated relations between cities and private water companies. But there were still other factors, particular to Shreveport, that also contributed to acrimonious relations.

For example, in the Shreveport area acceptable water supplies that could be tapped economically were difficult to come by. Ground water from shallow wells was hard and turbid. The supplies available from deep wells were better, but were still relatively hard and were woefully inadequate in volume. This left surface waters. Cross Bayou water was soft, but turbid, with occasional summer taste and odor problems. Initially bacteriologically acceptable, it deteriorated as the city grew along the stream and by 1901, as noted, was deficient in a number of respects. This forced the private franchise to seek alternative sources of supply, and those available at a reasonable investment (considering the limited life of the franchise) had unavoidable problems. The Red River provided sufficient volume, but its waters were objectionable because of color and taste deficiencies, were difficult to purify and were extremely hard. Moreover, the Red River was a notoriously unreliable and unpredictable stream. Its floods and shifting channel, as we have seen, impeded and finally destroyed the rather ambitious attempts made by the Shreveport Water Works Company to tap the relatively soft and pure water of Twelve Mile Bayou in the first decade of the twentieth century. This compelled the company to use Red River water, despite its deficiencies. But even after the river itself was tapped, floods and bank undermining were a constant threat to the private company's intake and service reliability. Thus the poor alternative water supplies available in the Shreveport area made it difficult for any private water company to provide a consistently reliable supply of good drinking water and permanently smother complaints.

It seems clear, therefore, that a large number of factors contributed to the poor relations between the Shreveport Water Works Company and the City of Shreveport and ultimately resulted in the non-renewal of the company's franchise to supply water to the city. Many of these problems, as noted, were shared with other cities and endemic to the private water supply system. They contributed to a steady nation-wide shift from private to public ownership in the 1890-1920 era. Thus, in 1888 over 56% of all water companies were privately owned, [132] but by 1915 the figure had declined to 31%, [133] and for cities in Shreveport's population class (cities above 30,000 people) the figure was even lower, around 25%. [134] It was to continue to decline.

1. For example, Shreveport City Council, Minutes, January 12 and August 3, 1909, and July 12, 1910.
2. Ibid., July 9, 1907 (report of J.A. Blanchard).
3. Ibid., July 11, 1911; Journal, June 14, 1911; and Times, July 7, 1911 (remarks of Fullilove).
4. Journal, May 30, 1911.
5. John H. Ellis, "Businessmen and Public Health in the Urban South during the Nineteenth Century: New Orleans, Memphis, and Atlanta," Bulletin of the History of Medicine, v. 44 (1970) pp. 360, 363-364; Blake, Water for the Cities, pp. 73-74, 204, 266, and elsewhere, for example.
6. Journal, June 14, 1911.
7. Times, July 7, 1911 (comments of E.K. Smith, President, Shreveport Chamber of Commerce).
8. Shreveport Chamber of Commerce, Executive Committee, Minutes, June 14, 1911. For the Mayor's proclamation see the Journal, June 14, 1911.
9. Shreveport Chamber of Commerce, Executive Committee, Minutes, June 19, 1911.
10. James C. Gardner, "The History of the Municipal Government of Shreveport: A Review," North Louisiana Historical Association, Journal, v. 1, no. 4 (Summer 1970) pp. 1-6.
11. Journal, June 20, 1911; Shreveport Chamber of Commerce, Executive Committee, Minutes, June 19, 1911.
12. Shreveport City Council, Minutes, June 27 and July 11, 1911.
13. Times, July 7, 1911; Journal, July 6, 1911.
14. Times, July 9, 1911; Journal, July 6, 1911.
15. Times, July 7, 1911.
16. See, for example, Blake, Water for the Cities, pp. 42, 271, and John Goodell, Water-Works for Small Cities and Towns (New York, 1899) p. 269.
17. Shreveport City Council, Minutes, July 11, 1905; Journal, July 12, 1911.
18. Shreveport City Council, Minutes, July 11, 1912; Fire and Water Engineering, v. 52 (1912) p. 112.

19. Times, July 7, 1911.
20. Journal, July 7, 1911; Times, July 7, 1911.
21. The single nay vote was cast by Paul Lowenthal who did not want to even consider the purchase of the old plant as an option. Times, July 7, 1911.
22. Shreveport City Council, Minutes, July 11 and July 25, 1911; Journal, July 11, 1911.
23. Rita C. Lynch, "Kansas City's Pioneer Engineers," American Public Works Association Reporter, v. 47, no. 7 (July 1980) p. 5.
24. Worley & Black, "Report," 1911, p. 145A; Journal, September 11 and September 12, 1912.
25. Worley & Black, Engineers, "Report on the Physical Value of the Shreveport Louisiana Water & Sewer Systems," December 1911, 173 pp.
26. Shreveport City Council, Minutes, September 11, 1912; Times, September 12, 1912; Journal, September 11, 1912.
27. Shreveport City Council, Minutes, October 28, 1912, contains a copy of Lynn's letter.
28. Ibid., October 29, 1912.
29. Ibid., January 2 and January 28, 1913.
30. Ibid., March 5, 1913; Times, March 5, 1911; Journal, March 6, 1911.
31. Times, March 5, 1913.
32. Times, September 13, 1913.
33. Shreveport Chamber of Commerce, Board of Directors, Minutes, November 12, 1912, and January 7, 1913.
34. Times, October 21, 1913.
35. Times, October 21 and October 22, 1913.
36. Times, September 18, 1915 (comments of Mayor Dickson).
37. Journal, October 22, 1913; Times, October 23 and October 24, 1913.
38. Journal, October 24, 1913.
39. Times, October 23, 1913.
40. Ibid.
41. Journal, October 22, 1913, and Times, October 23 and October 24, 1913.

42. Journal, October 24, 1913; Times, October 24, 1913.
43. Shreveport City Council, Minutes, February 10, 1914, notes the Mayor's letter.
44. Times, February 11, 1914.
45. Shreveport City Council, Minutes, February 10, 1914; Journal, February 10, 1914; Times, February 11, 1914.
46. Shreveport City Council, Minutes, March 10, 1914.
47. Times, April 3, 1914; Journal, April 3, 1914.
48. Shreveport City Council, Minutes, April 7, 1914.
49. Times, April 24, 1914.
50. L.C. Bulkley, compiler, "Report of [the] Waterworks Committee, City of Shreveport, Louisiana," [1914] 6 pp. + table.
51. Shreveport City Council, Minutes, July 14, 1914; Times, July 14, 1914.
52. Shreveport Chamber of Commerce, Board of Directors, Minutes, May 12, 1914.
53. Times, July 24, 1914.
54. Journal, July 20, 1914.
55. Journal, August 21, 1914; also August 19, 1914.
56. Times, July 24, 1914.
57. For examples of arguments for municipal ownership see Times, July 27, July 30, August 5, August 8, August 9, August 12, August 14, August 15, August 19, and August 20, 1914; and Journal, July 27, August 6, August 7, August 18, and August 20, 1914.
58. "Improvements at Shreveport," Fire and Water Engineering, v. 57 (1915) p. 246.
59. Journal, August 20, 1914.
60. Fire and Water Engineering, v. 56 (1914) p. 344.
61. Journal, July 24 and July 30, 1914.
62. See especially Journal, August 7, 1914 (Judge Pugh's remarks); Times, August 22, 1914.
63. Journal, August 19, 1914.

64. The case against the bond issue is argued in the Journal, July 27, July 30, August 1, August 3, August 5, August 7, August 8, August 18, and August 19, 1914, for example.
65. Journal, August 22, 1914.
66. Times, August 20, 1914.
67. Shreveport City Council, Minutes, August 21, 1914; Times, August 21, 1914 (preliminary), and August 22, 1914 (final); Journal, August 21, 1914.
68. Journal, August 21 and August 22, 1914; Times, August 21, 1914.
69. Maps showing the distribution of the sewer and water mains in Shreveport are in the back of the Worley & Black "Report" of 1911 and indicate that the wealthier areas of town were relatively well serviced. See also Times, October 8, 1914; Blake, Water for the Cities, p. 77; and Ellis, "Businessmen and Public Health," pp. 365, 371.
70. Mayor S.A. Dickson commented in 1915: "The well-to-do do not drink the water furnished by the Shreveport water company. They would not dare drink it. They buy their drinking water." The poor, Dickson added, could not afford to pay high water rates and buy drinking water on the side. Times, November 4, 1915. A typical issue of the Journal (June 10, 1911) contained three advertisements by companies selling bottled water. See also Stuart Galishoff, "Triumph and Failure: The American Response to the Urban Water Supply Problem, 1860-1923," in Martin V. Melosi, ed., Pollution and Reform in American Cities, 1870-1930 (Austin, Texas, and London, 1980) p. 41.
71. Fire and Water Engineering, v. 57 (February 10, 1915) p. 96.
72. Ibid., v. 57 (June 23, 1915) p. 425.
73. Shreveport City Council, Minutes, December 8, 1914; Journal, January 26, 1915.
74. Shreveport City Council, Minutes, March 23, 1915.
75. Ibid., August 30, 1915.
76. Times, August 31, 1915.
77. Times, September 2, 1915.
78. Shreveport City Council, Minutes, September 2, 1915; Times, September 17, 1915, also reported that city officials had said that they would not submit the issue of franchise extension to the voters unless compelled to under mandamus proceedings.
79. Shreveport City Council, Minutes, September 2, 1915; Times, September 3, 1915.

80. Shreveport City Council, Minutes, September 17, 1915, records a copy of Lynn's letter to the Council dated September 2, 1915, rejecting the Council's offer.
81. Shreveport City Council, Minutes, September 17 and October 2, 1915; Times, September 18, 1915.
82. For examples of the ads see: Journal, November 2 and November 3, 1915; Times, November 4, 1915.
83. For example, Journal, November 3, 1915; Times, November 4, 1915 (both the comments of Dickson and the editorial).
84. Journal, November 2 and November 3, 1915; Louisiana State Board of Health, Biennial Report, 1914-1915, p. 119.
85. Journal, November 4, 1915.
86. Shreveport City Council, Minutes, November 5, 1915; Journal, November 5, 1915; Times, November 5, 1915.
87. Journal, January 1, January 5, January 6, January 8, January 10, and January 19, 1916; Times, January 6, January 7, and January 9, 1916.
88. Journal, January 12, January 19, and February 8, 1916; Times, January 20, 1916.
89. Shreveport City Council, Minutes, March 14 and March 28, 1916.
90. Shreveport City Council, Minutes, July 25, 1916 (copy of communication from Shreveport Water Works Company, July 22, 1916).
91. Ibid., July 29, 1916.
92. Ibid., August 22, 1916; Journal, August 22, 1916.
93. Times, September 17, 1915.
94. "The Shreveport Water Case," Fire and Water Engineering, v. 59 (1916) p. 54.
95. Journal, February 23, 1916.
96. Shreveport City Council, Minutes, March 23, 1916; Journal, March 24, 1916.
97. Journal, March 28, 1916.
98. Journal, August 8, 1916; Shreveport City Council, Minutes, August 8, 1916. The Shreveport Water & Sewerage Department's drawing collection contains a set of blueprints which detail the plant Hawley planned to build for the city.
99. Journal, January 9, 1917, mentions plans to put the new plant on Douglas Island.

100. Shreveport City Council, Minutes, August 8, 1916; Journal, August 8, 1916.
101. "The Shreveport Water Works," Fire and Water Engineering, v. 60 (1916) p. 227. Fire and Water reported a conference between AWWG officials and the City Council. See also Journal, September 16, 1916.
102. Shreveport City Council, Minutes, September 18, 1916; Journal, September 16, 1916.
103. Journal, September 16, 1916.
104. Ibid.
105. Lynn's note is recorded in Shreveport City Council, Minutes, September 16 and September 26, 1916.
106. Ibid., September 18 and September 26, 1916.
107. Ibid., September 16, 1916.
108. For example, in 1911 Mayor Eastham referred to the property as "old and worn out," and Judge Pugh called the plant "old and useless" (Times, July 7, 1911). In 1914 G.W. Jack said the water works was "out-of-date" (Journal, August 20, 1914).
109. Journal, September 18, 1916.
110. Shreveport City Council, Minutes, October 10, 1916.
111. Journal, October 10, 1911.
112. For opposition to the construction of a new plant see Journal, September 18, 1916 (editorial), and September 26, 1916 (position of the Waterworks Committee). Also see Shreveport City Council, Minutes, September 26, 1916.
113. Shreveport City Council, Minutes, September 26, October 10, and October 11, 1916; Journal, October 10, 1916.
114. Ibid., November 15, 1916; Journal, November 15, 1916. The Journal on January 9, 1917, noted that after the election most of the bidders withdrew.
115. Journal, January 1, 1917.
116. H.G.H. Tarr, "More Than Fifty Years' Reminiscence in Waterworks," American Water Works Association, Proceedings, 1912, p. 53; Brownell and Goldfield, City in Southern History, pp. 112-113; and Robert H. Wieke, The Search for Order, 1877-1920 (New York, 1967) pp. 167-168.

117. Times, November 4, 1915 (S.A. Dickson).
118. Journal, January 2, 1917.
119. See, for instance, the story of Aaron Burr and the Manhattan Company in New York in Blake, Water for the Cities, pp. 44-62. See also Ellis, "Businessmen and Public Health," pp. 361-362.
120. Times, August 8, 1914 (Bulkley speech); Bulkley, "Report of [the] Waterworks Committee," p. 3.
121. For example, Journal, June 19 (Fullilove comment) and July 7, 1911.
122. Journal, August 5, 1914.
123. Tarr, "Reminiscence," p. 53, and Blake, Water for the Cities, pp. 40, 219.
124. City growth and rising standards of living which outran water facilities were common problems experienced by private franchises. See, for example, Blake, Water for the Cities, p. 219, and Galishoff, "Triumph and Failure," pp. 42-43 and elsewhere.
125. On the effect of public health on city growth see Ellis, "Businessmen and Public Health".
126. Shreveport City Council, Minutes, November 16, 1908.
127. Ibid., November 17, 1902 (Mayor Andrew Querbes' inaugural address).
128. Times, July 7, 1911; Journal, April 3, 1914.
129. Gardner, "Municipal Government of Shreveport," pp. 1-6.
130. Shreveport City Council, Minutes, November 14, 1910.
131. Journal, July 9, 1911.
132. Baker, Manual, 1888, p. xxxiv.
133. The McGraw Waterworks Directory, 1915 (New York, 1915) p. 615.
134. "Large Water-Works Figures," Engineering News, v. 74 (1915) p. 1273.

CHAPTER IV:

THE SEARCH FOR NEW SUPPLIES:

The Decision to Use Cross Lake (1917-1926)

THE EARLY YEARS OF MUNICIPAL OWNERSHIP

The \$1,200,000 1914 bond issue, besides allowing purchase of the private water and sewerage systems, had provided funds specifically for the extension of water and sewer mains to all parts of Shreveport. In 1916 the city had begun building these extensions on its own and, after purchasing the McNeil Street Station, with its distribution network, pushed this work forward rapidly. In 1917 alone the city installed fifty-one new fire hydrants, 337 new service taps, 46 miles of sewers, 7.5 miles of water mains, and two sewerage pumping stations. [1] Before the end of the first decade of municipal ownership the total length of the water distribution system in Shreveport had grown from 61 to 140 miles, [2] an accomplishment which could only have pleased the proponents of municipal ownership.

In other areas, however, the picture was not so bright. The bond issue had reserved around \$960,000 for construction and/or purchase of the old water and sewerage systems. Since the Shreveport Water Works Company was purchased for \$800,000, the city had nearly \$160,000 in surplus funds. A substantial body of opinion favored using this surplus to erect a softening plant. [3] But this hope was soon disappointed as other needs soaked up the surplus monies.

The Shreveport water system was probably not "junk class" when purchased, as some charged, [4] but it had definitely been operated "at its lowest ebb" [5] after 1912 as AWWG attempted to cut its losses when it became apparent that franchise renewal was doubtful. Simply to bring the system back up to effective operating condition required some immediate and heavy expenditures on the part of the city. McNeil's boiler plant exemplifies the problem. Installed in 1892, by 1912 the boilers were approaching the end of their useful life unless they were completely overhauled. But, recognizing that the life of the franchise was drawing to a close, AWWG had neither overhauled nor replaced them. Thus the infant city water department was compelled, almost immediately after assuming control of the plant, to request authorization from the Mayor to order three new 200 hp Heine water-tube boilers to replace the four boilers used through most of the period of private ownership. [6] Nor was this the only problem area. The pipes of the water distribution system had not been cleaned since 1912 and, due to the hardness of Red River water, required immediate attention. [7] In November of 1918 deficiencies in the settling basins caused a major breakdown at the pumping station and forced the department.

to pump raw water into the city mains. [8] No sooner had this fault been corrected, than the chlorinator broke down. [9] Additions and repairs like these, required simply to bring the plant back up to efficient operating condition and keep it operating, created "extraordinary expenses" and absorbed the money which was to have gone for the softening plant. [10]

The improvements carried out at McNeil in the aftermath of city acquisition of the plant and the massive expansion of the water and sewage mains also killed another hope of many advocates of municipal ownership -- lower prices for water. [11] The City Council in April 1917 voted to retain the schedule of rates used by the private corporation and was to keep them in effect for many years. [12] Moreover, the city gave its own water department the authority to place meters on all taps and charge at meter rates at its prerogative, something it had attempted to deny the private franchise. [13]

Personnel turnover further clouded the early years of municipal ownership. The Superintendent of the Shreveport Water Works Company, W.R. Goss, was retained by the city to head its water department, for Goss, despite the troubles between the City Council and his parent company, American Water Works and Guarantee, had managed to maintain good relations with city officials. [14] In February 1918, however, he resigned, a resignation accepted with regret by the Council. [15] Several other key office and clerical employees associated with Goss and the private franchise period resigned at the same time. This personnel problem was further complicated by the military draft of World War I. The draft took a heavy toll on the infant water department. Leon I. Kahn, then Commissioner of Public Utilities, complained in 1918 that as a result of the resignations and the draft the "entire personnel" of the water department had "almost entirely changed" within the year. [16]

The City of Shreveport, however, was fortunate in one respect. Goss' replacement as Superintendent-Engineer of the water and sewerage system was Thomas L. Amiss, a man of considerable integrity and ability. Amiss came to the job well equipped. He had first settled in Shreveport in 1901, working as superintendent of a sewer construction crew for the Shreveport Water Works Company. In 1903 he had been placed in charge of all outside work, and in 1904 had become resident engineer and assistant superintendent under Goss. Amiss worked with Goss for over a decade. Then in 1915 AWWG transferred him first to their Little Rock, Arkansas, works; then to their Chattanooga, Tennessee, plant; and, finally, to the main office in Pittsburgh. Amiss left AWWG and returned to Shreveport in August 1917, accepting the position of Assistant Superintendent in the now municipally owned works, before succeeding Goss as Superintendent in April 1918. [17]

Amiss was to hold the post of Superintendent-Engineer for more than forty years, even though the office required annual reappointment by the Commissioner of Public Utilities. The keys to his success were ability, a pleasant personality, and devotion to duty. The last was exemplified in 1925. On September 4, 1925, at 5 p.m., as a result of lateral movement of the ground during a serious drought, all three mains leading from the McNeil Street Station into the city ruptured. Realizing that this left the city without a water supply and fearing a serious fire, Amiss set to work to

restore service. Despite receiving an "urgent message" to come to the bedside of a dying brother shortly after the break occurred, he remained on the job until the break was repaired at 12:45 a.m., the following morning. Amiss' concern proved to be justified. Four hours after the break, but well before repairs were completed, fire broke out in the Allendale district. It raged out of control, destroying 200 houses and damaging \$500,000 in property before the break was corrected and water was available for fire fighting. [18]

In addition to personnel turnover, World War I also caused materials shortages and raised the price of essential materials. Kahn noted in his 1918 report to the City Council that wartime conditions had raised the price of "the most essential articles used in the operation of this plant." The water department was compelled to respond to these conditions with temporary expedients. Due to difficulties in securing large pipe, for example, the department installed as a "temporary relief" 6664 feet of 2-inch pipe, a size normally considered too small for water mains. [19]

Extensive repair work, frequent equipment failure, high personnel turnover, and high materials costs were in themselves serious problems for the new municipal Water and Sewerage Department. But, making matters worse, there were two more serious problems -- the poor quality of the basic water supply (the Red River) and the inadequate pumping capacity of the pumping station. It was relatively easy to postpone a solution to the first of these problems, for the city had grown accustomed to the poor quality of its water. But a solution to the problem of inadequate pumping capacity was an immediate imperative.

Average daily consumption in Shreveport by 1917-1918 was approaching 4 mgd. Maximum daily consumption during the summer months ran much higher, approaching the 10 mgd maximum capacity of the plant in peak hours and surpassing its 6 mgd "sure" capacity (capacity with one unit down for repairs or maintenance), as well as the capacity of the Red River syphon. [20] To provide adequate water steam pumps on some days had to be operated above their rated capacities, further increasing the frequency of breakdowns and increasing labor and operating costs above already high levels. Amiss reported in 1918 that the city had "clearly outgrown" the McNeil Station's capabilities and warned that during the summer months pumping capacity was so far over normal that he was forced at times to operate the pumps "up to the danger point." [21]

While the Commissioner of Public Utilities, Kahn, accepted Amiss' evaluation of the seriousness of the problem, high wartime materials prices and, no doubt, a reluctance to approach the voters with a request for more money so soon after the city's acquisition of the water system discouraged adoption of the most obvious corrective measures -- purchase and installation of more steam pumps. [22] This measure would, moreover, have involved heavy expenditures. It would have required not only the purchase of new steam pumps, but also the enlargement of the McNeil Pumping Station building since there was no room inside that structure for additional pumping units.

Since money for massive corrective measures was not available, Amiss and his staff were compelled to resort to temporary expedients to keep the city's water demands within the capacity of the existing pumps and the

syphon system. One of the expedients was conservation. This took two forms. In 1917 the Water and Sewerage Department conducted a Pitot meter survey of its distribution system and a house-to-house inspection of connections to detect and eliminate leakage. [23] At the same time it launched a concerted effort to meter as much of its system as possible, since it was widely conceded in water works circles that the installation of meters reduced waste and brought a significant decline in per capita water consumption. [24] In 1917 the Water Department purchased 1000 meters and installed 700 (400 on new service, 300 as replacements for old meters), and in 1918 it installed 541 new meters. [25] Already, at the end of 1918, Shreveport claimed to have one of the "best equipped and most modern" meter departments in the South. [26] And Leon Kahn, the Commissioner of Public Utilities, reported that without the reduced consumption due to metering the McNeil plant would probably have been overtaxed and put out of commission in 1918. [27] The drive for a completely metered service had reduced the number of flat rate customers on the Shreveport water mains from 21% in 1917 to 1.7% by 1926. [28]

Elimination of leakage and the installation of meters temporarily reduced consumption in Shreveport and kept water demand within the capabilities of the McNeil Station's pumping capacity. The old Red River syphon, however, was inadequate even for that capacity. Its intake was only 20 inches in diameter (the main body of the syphon was 30 inches), and by 1918 it was able to deliver "scarcely enough water" to satisfy increased summer demands. In 1918 the syphon intake was enlarged to 30 inches without interrupting service. [29] Despite this, the syphon remained a problem. The water it delivered from the Red River was hard and often turbid, and it was necessary to move the intake every time the course of the river changed, something all too frequent in the early twentieth century. [30]

The Shreveport water system's water quality problem was alleviated, at least in part, by the Caddo Levee Board. In the late 1910s the Levee Board constructed a new canal linking Twelve Mile Bayou with Cross Bayou above the McNeil Street plant. This new canal, designed to permit water to flow more freely from Twelve Mile Bayou, was part of a project to reclaim overflow and swamp lands in north Caddo Parish. But it also improved Cross Bayou. The increased influx of water into Cross Bayou enabled the Water Department to abandon the Red River syphon for much of the year. When the bayou's level was high and an abundance of soft Twelve Mile Bayou water was flowing into the stream, Cross Bayou water was pumped into city mains. The syphon, with its hard Red River water, was used only in the summer and fall months when the level of Cross Bayou was low. In 1921, for example, Shreveport was served Cross Bayou water 208 days, Red River water 139 days, and a mixture of the two 18 days. [31]

The Levee Board project, however, also involved making Cross Bayou navigable, and this required modifications to the syphon line since it crossed Cross Bayou on piles. W. R. Goss, before his resignation, had prepared plans to replace the single 30-inch line on its bridge of piles with four 16-inch submerged lines paralleling the course of the 30-inch line. [32] This plan, implemented by Amiss between 1919 and 1921, was carried out at

the expense of the Levee Board and marked an improvement in the syphon system. Submerging the line made it less susceptible to damage by accident, and the use of four lines insured that a single rupture would not shut down the entire system.

Even though the Caddo Levee Board's ditch allowed the city to use soft water for a number of months, it was still dependent on Red River water for much of the year. This water continued to cause problems. The hardness of this supply was a continuing source of irritation and concern and cost the Water Department several major customers, including the Kansas City Southern Railroad Company. [33] Not only did it aggravate customers, but it was an even more direct source of concern to the Water Department. Encrustations from hard water accelerated the depreciation of the boilers, feed water heaters, and other equipment in the pumping plant, and the futile attempts to counteract its hardness only caused skyrocketing chemical costs. [34] The water's turbidity was also a problem, for the McNeil plant had not been designed in 1886 to handle it. In November of 1918, when the turbidity of the water being brought in by the syphon reached the incredibly high figure of 75,000 ppm, improper facilities (no baffling or mixing chambers) for mixing chemical coagulants with the water caused a major breakdown at the station. Raw water had to be pumped into the mains for several days, and citizens were advised to boil water before drinking. Amiss in his 1918 report to the Commissioner of Public Utilities, warned that this could happen again if facilities were not modernized for handling turbid waters. [35]

Overall, the record of the Shreveport Water and Sewerage Department during the first few years of municipal ownership can probably best be described as mixed. There were improvements in the system and massive extensions of the water and sewer mains. But some of the fundamental problems of the system remained unsolved. The most critical problem, the problem which had plagued the city since its founding, was water quality. The return to Cross Bayou for a supply for part of the year was, at best, a partial, temporary, and ultimately unsatisfactory expedient.

City water, for lack of anything better or cheaper, continued to be used for domestic and sanitary purposes. But scattered evidence indicates that many people remained reluctant to drink it. [36] The taste and color problems of Red River water, the suspicion that Cross Bayou water was being contaminated with human wastes, and the long history of conflicts over water quality between the private water company and the city, coupled with incidents like the November 1918 breakdown, undoubtedly contributed to suspicions that city water was not fit for human consumption. Thus, when Shreveport experienced a major typhoid outbreak in mid-1917, city water was immediately suspected. [37] During another outbreak of typhoid in 1919 the water supply was again blamed. [38]

In both cases the charges against the city's water were found to be false. In 1917, for instance, the city asked George G. Earl, Superintendent of the Sewerage and Water Board of New Orleans, and Guy Eldbridge, a chemist and bacteriologist, to inspect the city's water system to determine if it were, indeed, to blame for the spread of typhoid. They tested the water

in the mains and inspected the water purification facilities at McNeil, finding both in good order. The purification and pumping station, they reported, was "scrupulously clean and in excellent order." Some of its equipment was outmoded, but, they added, the Water Department's careful attention and frequent tests insured that water being supplied to the city was free from contamination. According to Earl there was not "the remotest chance" that the water supply was "in any possible way" linked to the typhoid outbreak. [39] The committee which reviewed the supply in 1919 reached a similar conclusion: no cases of typhoid were traceable to the city's water. [40]

But even while exonerating the water supply of guilt, outside consultants like Earl were concerned about the suspicions held by Shreveporters about the quality of the city's water. Earl noted:

I had not been in Shreveport more than half an hour before I was assured of a certain water offered me to drink, 'this is not city water; there is a lot of talk about the city water.'

Talk like this, he believed, was damaging to the city and a positive detriment to locating and eliminating the true cause of the typhoid outbreak, since everyone simply assumed it was the water. Earl thus urged the city to modernize its purification system and seek a "more consistently satisfactory" water supply as soon as possible. [41]

CROSS LAKE -- BACKGROUND [42]

It was generally assumed by 1917 that this "more consistently satisfactory" water supply would eventually come from Cross Lake, for, as we have seen, the city had begun to take steps to secure rights to that lake for use as a reservoir in 1909. Recognition of the lake's possibilities, however, predated the city's efforts by at least ten years. In 1898 the American Water Works and Guarantee Company, apparently in anticipation of purchasing the Shreveport Water Works Company from the Yourees, sent one of their field engineers, J.N. Chester, to Shreveport to survey possible water supplies. Chester surveyed Cross Lake, finding a small body of water, covered by a thick scum, inhabited by gar and marsh hens, and smelling to "high heavens." Chester later recalled:

When I first looked over the site of Cross Lake many years ago . . . the place was a jungle . . . But I envisioned a lake here that would provide the city with all the water needed for future generations. [43]

But AWWG, apparently at Chester's recommendation, chose to tap Twelve Mile Bayou first. Development of Cross Lake c1900 would have been very expensive and was too large an investment for a franchise with only a little more than half of its life remaining.

The possibility of using Cross Lake as a reservoir for the city's water supply was raised publicly in 1903 or 1904 by Councilman Paul Lowenthal, who recommended that the city take steps to secure title to the lake bed. [44] But his suggestion lay dormant for some years, probably because the Shreveport Water Works Company had just developed the Twelve Mile Bayou system and was

temporarily able to supply water sufficient in both quality and quantity to quell most critics. But the deterioration of the Twelve Mile Bayou system and the increased contamination of Cross Bayou by city growth made revival of the Cross Lake idea inevitable.

In 1906 a committee from the City Council visited Cross Bayou following public complaints and found it in "alarming condition." [45] In response to the committee's report, the Council in January 1907 appointed a committee made up of the city engineer and members of the Council's water committee, and headed by Ashton Blanchard, the local Public Health Officer, to investigate the status of Cross Bayou and make recommendations for changing the source of the city's supply. Blanchard, in his August 1907 report to the Council, vociferously condemned the use of Cross Bayou water, even when diluted by Twelve Mile Bayou water, asserting that the growth of the city had contaminated the bayou and made it "imperative" to find a new source. [46]

Blanchard, on behalf of the Committee, recommended using the Red River. He was supported by W.E. Martin, the City Engineer, and Major F.M. Kerr, Chief of the State Engineers. Due to fear that future city growth would contaminate any of the smaller bodies of water in the area, including Cross Lake, and that tapping supplies distant from the city would be too expensive, the Red River seemed attractive. Its waters, though hard, were bacteriologically pure and its flow was sufficient, not only to supply any conceivable need of the city, but also to purify itself of human pollution. Moreover, no massive engineering feats were required to tap the Red River, and there were no problems involved with litigation from private owners. These were likely the arguments which persuaded the Shreveport Water Works Company to tap the Red River in 1911 when its Twelve Mile Bayou system completely collapsed.

There was, however, one dissenting voice on Blanchard's committee -- George Wilson, the Parish Engineer. Wilson revived Lowenthal's 1903-1904 suggestion of Cross Lake. He pointed out that a reservoir could be constructed in the old lake bed by using (with suitable reinforcement) the new embankment constructed across the eastern end of the lake bed by the Kansas City Southern Railroad and erecting a concrete spillway at Rocky Point. The lake created by these modifications would provide the city with a reservoir 10 feet deep, 12,000 acres in area, with a storage capacity of 32 billion gallons. Wilson believed that contamination of this reservoir would not be a serious problem because the city limits were still some distance from the lake and because the lake was located at an altitude higher than the city, so natural drainage would be away rather than towards it. [47]

Wilson's suggestion received little support at the time. But in 1909 his Cross Lake reservoir scheme was revived, probably as a result of the further deterioration of Twelve Mile Bayou and the city's water supply following the 1908 Red River flood. On January 12, 1909, Paul Lowenthal, acting as Chairman of the Council's "Water Committee," introduced to the Council a report from Wilson, who was now the City Engineer, recommending the use of Cross Lake as a future water reservoir for the city. After presenting Wilson's report, Lowenthal persuaded the Council to authorize an investigation to determine the feasibility of Wilson's recommendations and of securing title to the lake bed. [48]

This committee reported back to the Council in July and August of 1909. [49] Noting that Twelve Mile Bayou might entirely disappear if the Red River flooded several more times and that Red River water was unacceptable, the committee recommended that the city acquire Cross Lake as insurance for the future. The Council, on Lowenthal's motion, authorized the Mayor to call a joint meeting of the City Council with the Shreveport Board of Trade, the Progressive League, the State Fair Association, the Cross Lake Hunting and Fishing Club, the Caddo Levee Board, the Board of Health, and Caddo Parish's state assembly members to secure advice on how the city could acquire title to the 10,000 to 15,000 acre bed of Cross Lake. [50]

A meeting with many of these groups was necessary because in 1909 ownership of the lands in question was in litigation. In 1812, when Louisiana had been admitted to the union, the United States Congress had ceded to the state all lands beneath navigable water. In 1812, due to waters backed into Cross Bayou by the "great raft" or log jam on the Red River, Cross Lake had been navigable and had occupied a bed approximately the size of the reservoir being proposed by Wilson and Lowenthal. The removal of the log jam had caused the lake to recede so that by 1900 Cross Lake was much smaller and sometimes nearly dry. In 1892, in the act which created the Caddo Levee Board, the Louisiana Legislature had granted the Board all state lands in its district, including the old bed of now, much diminished, Cross Lake. In 1895 the Caddo Levee Board had sold the lake bed to a group of sportsmen, the Cross Lake Hunting and Fishing Club, for 10¢ an acre, or \$1100 for 11,000 acres. These funds were deposited in a bank pending issuance of a proper deed. The club took possession of the lands, but the deed was delayed since the state's land office had still not formally transferred the land by proper deed to the Caddo Levee Board in 1895. In fact, the deed had still not been issued in 1901 when the United States Land Office requested that the state of Louisiana adjust all unsettled land matters between it and the federal government. This request led, in 1902, to legislation which repealed the act of 1892 as it applied to lands (like the Cross Lake bed) where no formal conveyance of deed had been issued by the state's land office. Attempts to clear up the land ownership issue eventually caused the Cross Lake Hunting and Fishing Club to sue the state to secure rights to the land it had occupied for a decade. Its claim was upheld by the local district court. But the Louisiana Supreme Court supported the state's position when the verdict was appealed. The Club then petitioned the United States Supreme Court. This appeal was still pending in early 1910 when the city had begun to try to secure title to Cross Lake. [51]

In an attempt to get some clarification on ownership of the lake bed in case the state's position was upheld and because other complications (to be discussed later) had emerged, Mayor J.R. Dickson sent City Attorney Lowell C. Butler to Washington, D.C., in October 1909 to investigate records in the General Land Office. [52] Then, in April 1910, at Lowenthal's urging, and probably with Butler's advice, the Council voted to petition the state to transfer its title to the bed of Cross Lake to the city for use as a water reservoir. [53] Butler then drafted what eventually became Act 31 of 1910 of

the Louisiana State Legislature and had Caddo Parish's assemblymen introduce it. [54] By July it had been passed by both houses and signed by the Governor. Act 31 required the city to pay the nominal price of \$1 per acre for the 11,000 acres of the lake bed claimed by the state and take title within two years. If the bed were not used as a water reservoir within ten years title would revert to the state, and, as insurance that the lands would not be used for any other purpose, the state retained mineral rights. [55] Shortly after the passage of Act 31, the United States Supreme Court dismissed the appeal of the Cross Lake Hunting and Fishing Club on the grounds that no substantial federal question was involved. [56] This decision and the passage of Act 31 seemed to clear the way for the city to acquire the bed of Cross Lake. Thus, at the July 12, 1910, meeting of the City Council Lowenthal introduced a resolution calling for the appropriation of the \$11,000 needed to secure the lands from the state. The matter, however, was referred to the Council's finance committee. [57]

Matters were at this point when the sustained drive for municipal ownership began in 1911. From 1911 through 1916 public debate centered on, first, the issue of whether to renew the franchise or not, and, then, on whether to buy the old plant or build a new one. But the source of supply for the city's water was an important secondary issue. For example, the resolution introduced by Rives at the executive meeting of the Chamber of Commerce which launched the municipal ownership drive included not only a call for hiring a competent engineer to determine the size of bond issue necessary for purchasing the Shreveport Water Works Company plant or building a new one, but also a call for a bond issue to raise money to purchase Cross Lake from the state. [58] And Rives voted against the February 1914 call for a \$1,000,000 bond issue in part because it would not have provided sufficient funds to develop Cross Lake, as well as build or purchase a pumping and distribution system. [59] The Fullilove resolution which authorized the Mayor in September 1912 to offer \$607,000 to the Shreveport Water Works Company contained a provision which requested the Mayor, if the offer were accepted, to immediately call an election for a bond issue for the purchase price of the Shreveport Water Works Company plus the \$11,000 necessary to purchase Cross Lake from the state, and if the offer were refused to call an election for a bond issue for constructing a new plant plus \$11,000 for Cross Lake. [60]

The decision to use a Board of Appraisers to set a price for the water system compelled the Council in January 1913 to deal with the acquisition of Cross Lake separately. On January 2, 1913, the Council voted to place the question of issuing bonds to raise \$11,500 to purchase Cross Lake from the state on the ballot with seven other proposed bond issues. [61]

Even though the City Council was solidly behind the acquisition of Cross Lake and believed it was the logical future source of supply for Shreveport, there were some who dissented. A.M. Lynn, the President of the Shreveport Water Works Company, argued that Cross Lake would be subject to contamination by city growth, if not by oil and gas wells in the area. He pointed to the expense of the project and the farm land which would be flooded by the proposed reservoir and concluded that the Red River was the

only feasible permanent source of supply for the city. [62] His assessment of the situation was supported by some of the advocates of municipal ownership like L.C. Bulkley, as well as by opponents of municipal ownership like Judge Pugh. [63] The Times condemned both the Red River and Cross Lake and argued that the city should try, once again, to tap artesian supplies. [64]

But at the March 5, 1913, bond election property owners overwhelmingly approved the proposal to issue \$11,500 in bonds to purchase the bed of Cross Lake. The final tally was 475 (\$2,143,551) for to 183 (\$1,276,610) against. [65] As in the 1914 referendum bond election (already discussed in the previous chapter) there was a correlation between wealth and a "no" vote. The average assessment of those voting "no" was nearly \$7000; the average assessment of those voting "yes" only around \$4500.

By 1913, however, the state's two year time limit had expired. And before the bonds could be drawn up and sold, rumors reached the city from the state capital that the bed of Cross Lake was about to be leased to oil companies. [66] Fearing that this would permanently ruin the Cross Lake watershed and make the bed of the lake useless as a water supply reservoir, the city responded quickly. In June 1913 the city's attorney, A.W. Jack, informed the Chamber of Commerce of the problem and asked the Chamber to assist the Council in opposing these plans in Baton Rouge. [67] In November the Mayor was authorized by the Council to draw a check for \$11,500 and to formally notify the governor that the city was ready to take title to the Cross Lake lands. [68] He did so, and in May 1914 was notified that the papers were ready in Baton Rouge. On May 22, 1914, the Council authorized the Mayor to go to the state capital and accept title. [69] Four days later the Council asked the legislature to prohibit the lease or sale of mineral rights on the property for ten years. [70]

The Council's fears for the lake bed proved fully justified. Even though the city had assumed title to the lake, the Governor of Louisiana in early 1915 advertised for bids for the lease of mineral rights to the 11,000 acres. Shreveport's City Council promptly protested. [71] To further strengthen its position the incumbent Mayor, S. A. Dickson, asked the Board of Directors of the Chamber of Commerce to back the Council. The Chamber responded by sending a delegation of four prominent businessmen to the state capital. [72] At the same time, the city took legal action. The issue was ultimately settled out of court in December 1915. The Council agreed to withdraw its appeal to the State Supreme Court to stop drilling and exploration for oil and gas in the bed of Cross Lake. In return, the Council secured from J.W. Atkins, who was already drilling test wells in the lake bed, a guarantee that the site would not be damaged or Cross Lake's waters contaminated by his activities. Atkins was required, as insurance, to post \$2500 bond. [73] As late as 1918 some drilling was carried out in Cross Lake, but fortunately for the city, no major strikes were made. [74]

The Cross Lake project remained dormant for some years after the 1913 bond issue, partially due to indecision over whether the city would buy the old plant or build a new one, partially due to confusion about the ultimate cost of a municipal water and sewerage system (whether bought used or built new), partially because there was justifiable doubt about whether the city could afford to acquire both a water/sewerage system and a massive new impounding reservoir (i.e., Cross Lake).

The difficulties encountered by the city due to the deficiencies of the Red River supply in 1917 and 1918, the first two years of municipal ownership, revived interest in the Cross Lake project. In his first annual report on the water system to the City Council, Leon Kahn, the Commissioner of Public Utilities, enumerated the problems the city was encountering -- steadily rising costs in chemicals needed to treat Red River water, the wear and tear suffered by boilers because of the hardness of the water, problems keeping the syphon operable due to the constantly changing course of the river. He then strongly recommended to the Council that it give "serious consideration" to a future "permanent soft water supply." [75] The Council acted on this recommendation and in 1918 retained the firm of Chester & Fleming of Pittsburgh, Pennsylvania, to undertake a study of Shreveport's alternatives.

There was good reason to choose Chester & Fleming. The head of the firm, J.N. Chester, was thoroughly familiar with the Shreveport situation. As an agent for the American Water Works and Guarantee Company from 1899 to 1906 he had made several surveys of prospective water supplies for the firm's Shreveport works. As an independent consulting engineer after 1911 he had specialized in the water works field and had been associated with more than thirty water works improvements projects. [76] In brief, Chester was thoroughly acquainted with Shreveport's water problems, specifically, and with the water works business, generally, and had a national reputation in his field.

THE 1919 CHESTER & FLEMING REPORT

Chester investigated a number of possible sources for future city water supply in depth, although, in all probability, he had already decided on Cross Lake based on his earlier experiences in the area. Chester first considered the use of a supply from deep wells. There was still some sentiment in Shreveport for the use of artesian water sources, and deep well supplies were popular because they were often free of the taste, odor, and health problems that plagued surface supplies. Chester, however, found that all of the existing deep wells in the Shreveport area combined produced less than 1 mgd, while average demand in the city was four times higher and steadily rising. Moreover, the water from deep wells in the Shreveport area, while not as hard as Red River water, was still hard, and, Chester feared, due to oil drilling operations around the city, this water supply would be constantly subject to contamination. Finally, Chester pointed out the unreliability and high cost of the machinery (air lifts) required to bring the water to the surface from a deep well. He estimated pumping costs to be ten times higher than with normal pumping equipment. [77]

A second possible supply was the Red River, the only flowing stream in the area with a volume large enough to be seriously considered. Chester was suspicious of the Red both in terms of quality and quantity. He feared that the "treacherous nature" of the river and its constant fluctuations might make it difficult, regardless of the volume of water flowing in the river, to deliver a sufficient quantity to the pumping station. In quality Red River water clearly fell short of acceptable standards. The water was extremely hard (165 ppm in July 1918 when tested), and Chester noted:

At the average stage and low water there are few streams in the United States whose waters exceed those of Red River in hardness, and as a future supply for Shreveport it could be considered only in connection with a softening plant, the use of which in the present state of the art we cannot advocate . . . [due to the expense of operation and the poor quality of the taste of the water produced]. [78]

With ground and flowing surface water eliminated, Chester considered the creation of storage reservoirs. He reviewed four possibilities -- Soda and Caddo lakes around 15 miles northwest of Shreveport; the bed of Bodcau Lake, 10 miles north of Shreveport in Bossier Parish; and, of course, Cross Lake, a mile or so west of the city. (See Table 15)

Bodcau, Chester found, could be converted into a reservoir with storage capacity sufficient for the city's needs for at least fifty years by erection of a large dam. Chester, however, felt better alternatives were available. The bed of old Bodcau Lake was in another parish, 9 to 10 miles from the city and separated from the city by a range of hills which would require the construction of a pumping station to bring the water into Shreveport. [79]

Soda Lake, north of the city, was rejected because its waters mingled with those of the Red River and because the tracks of the Texas & Pacific Railroad in the area were at such a low grade that they would be flooded if any type of reservoir were constructed. [80]

Above Soda Lake, separated from it by an existing U.S. government dam, was Caddo Lake. Due to the dam Caddo had a surface area of 33 square miles and a storage capacity above 62 billion gallons, sufficient volume to supply the city's water needs for many years. And the quality of the water was presently acceptable. But, Chester noted, tapping Caddo Lake at the dam would require the construction of 17.5 miles of conduit at a cost of nearly \$1,000,000, too large a figure for Shreveport's financial resources in 1919. The alternative, allowing Caddo Lake water to flow through Soda Lake, Twelve Mile Bayou, and other available channels (like the recently completed Levee Board Ditch) to Cross Bayou risked contamination of the supply, especially in the mile above the McNeil Street Station. Moreover, the silting of Cross Bayou made it difficult to insure a depth adequate for the suction pipes of the pumps at McNeil. Chester also noted that mushroom towns and extensive oil drilling in and around Caddo Lake posed a very severe contamination danger. [81]

This left Cross Lake (see Table 16). Chester maintained that Cross Lake was the one supply which promised the highest quality and quantity of water for the city at the least price and with the fewest complications. The city already owned the bed of Cross Lake, and it was far closer to the city than the alternative reservoir sites. There had been little drilling activity in the Cross Lake area, and the city had not yet grown around it, so steps could easily be taken to maintain the lake's purity. Chester recommended, as the city's engineer had some ten years earlier, that the city utilize the embankment of the Kansas City Southern railroad, reinforced,

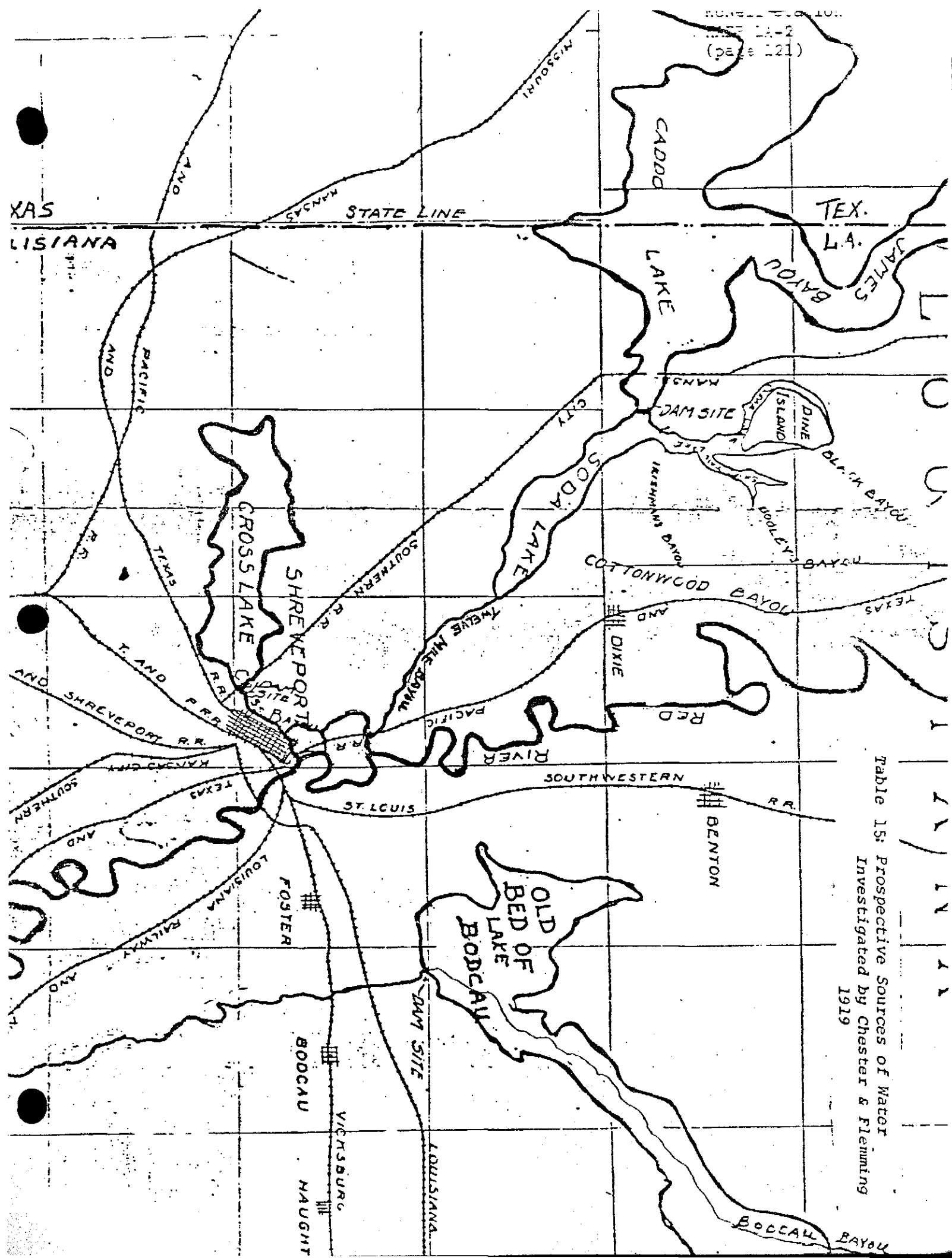


Table 15: Prospective Sources of Water
 Investigated by Chester & Flemming
 1919

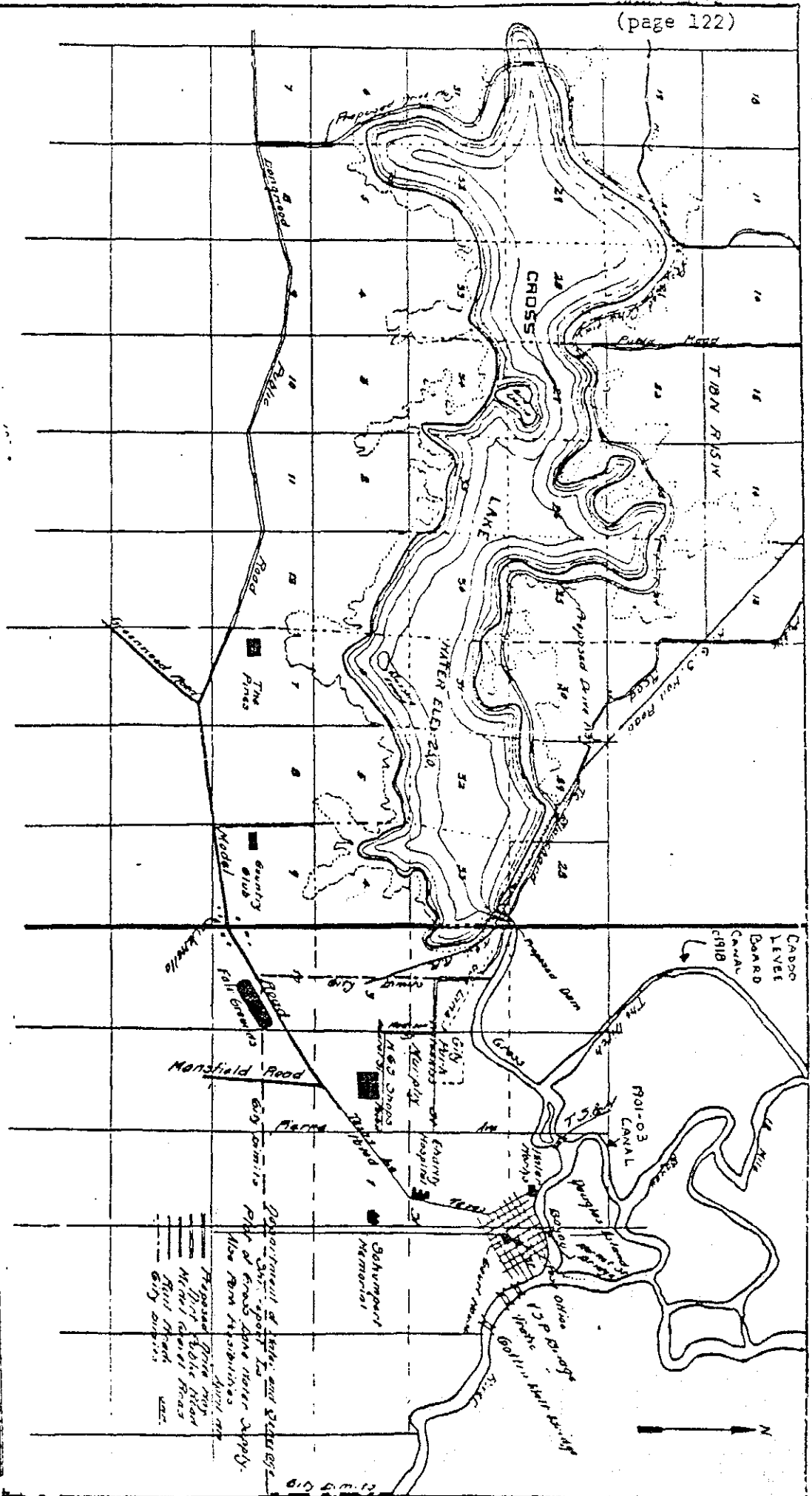


Table 16. Cross Lake and the City's Water System c1920-c1930

as a dam, adding a concrete spillway at the point its trestle passed over Cross Bayou. He calculated that this would provide the city with an impounding reservoir almost 12 square miles in area, with a watershed of 207 square miles, and a storage capacity of more than 9 billion gallons. Properly cleared before water was impounded, the bed of Cross Lake would not only provide a storage reservoir, but would eliminate a swampy area that was a potential health menace and replace it with a body of clear water with potential scenic and recreation value. The waters of this lake would flow by gravity through a 30-inch diameter conduit from Cross Lake to the McNeil Station, avoiding the natural bed of Cross Bayou to reduce the possibility of contamination. [82]

Because the existing pumping and purification facilities at McNeil Street were, as noted, being pushed beyond their safe capacity, Chester was also asked by the city to review options for enlarging or improving these. Chester considered both constructing a new plant on the banks of Cross Lake and enlarging McNeil. The new plant, he found, would have several advantages. It would be adjacent to the water supply, so no long raw water conduit would be needed. Because it was close to the southern and western parts of town, a new plant would obviate the need to reinforce the distribution system in these areas, otherwise necessary.

But, Chester felt, there were disadvantages that overweighed these assets. A Cross Lake site would be distant from the congested downtown area where the danger of fire was greatest. Distribution mains would be long, and, due to friction and other problems, it would be difficult for the new plant to provide sufficient pressure at a major downtown conflagration. The McNeil Street Station, on the other hand, was in convenient proximity to downtown Shreveport. Another advantage possessed by the existing station was its ability to quickly and easily tap three sources of water -- the Red River, Cross Lake through the proposed conduit, and Caddo Lake through existing channels and canals. Thus, even though Chester found that a new plant at Cross Lake would cost a little less than enlarging the McNeil Street Station, he recommended the latter. [83]

To improve the pumping and purification plant at McNeil and prepare the plant for the reception of Cross Lake water, Chester proposed a number of betterments:

- (1) Enlargement of the low service pump room to provide space for an additional triple expansion vertical low service pump and a horizontal, crank-and-flywheel, cross compound high service pump, plus room for additional expansion to the pumping plant later;
- (2) Construction of a tunnel and a new suction line from the existing receiving or wet well on Cross Bayou to a new pump pit erected in the station for the new low service pump (the pit to be made large enough for a second low service pump in the future);
- (3) Remodelling of the settling basins, substituting vertical walls for the existing sloped walls, and bottoms which sloped to a common point for the flat bottoms for easier and faster cleaning;

- (4) Installation of adequate mixing and baffling facilities, i.e., new aerators and mixing chambers with baffles;
- (5) Construction of adequate clear water storage, i.e., replacement of the very small 65,000 gallon clear water well with a clear water well adequate to meet peak loading on the system (3 million gallons);
- (6) Erection of a wash water tank for backwashing the filters instead of relying on water direct from the discharge lines on the high service side of the pumping system. [84]

Chester delivered his report to the city on March 19, 1919. It was read and ordered filed at the March 25 meeting. [85] Several steps were taken immediately. Chester had recommended, for example, that the city quickly insure that Cross Lake was protected from contamination due to oil and gas exploration, and Superintendent-Engineer Amiss at the March 25 meeting presented materials supporting this recommendation. The Council referred the matter of mineral leases in the Cross Lake bed to the Mayor, authorizing him to take up the matter immediately with the governor. [86] The Council also voted to have Commissioners Lilley and Kahn condense the Chester & Fleming report and have it published in pamphlet form for public information. [87]

The inertia that always makes it difficult for governmental bodies to react quickly delayed matters for some months. Fearing that action on the Chester & Fleming recommendations would come too late, Amiss informed the City Council on August 18, 1919, that the McNeil Street plant was pumping over safe capacity and that it was "absolutely necessary" that the plant be enlarged before next summer. The sooner work began on a bond issue to finance this work, he concluded, the better. Mayor Ford assured Amiss that the Commissioner of Finance was pushing the bond issue as fast as possible. [88]

THE 1919 BOND ISSUE AND THE ENLARGEMENT OF McNEIL

The Council's plans, originally, were to ask tax payers to approve a bond issue of \$800,000, approximately half to be used for the Cross Lake project, half for McNeil's enlargement. [89] But when the Council passed Ordinance 66 of 1919 on September 23, 1919, it requested authorization to issue only \$400,000 in bonds, the proceeds to be used only to enlarge McNeil. [90] Several factors contributed to this decision. Improvements at McNeil were needed immediately and were, in any case, necessary prerequisites to the effective use of Cross Lake water. Cross Lake could be postponed. The Council may have feared asking for too much money so soon after the city had purchased the water system. Also, it had a good excuse for postponing the Cross Lake project. Additional complications (to be discussed in more detail later) had arisen over the city's claim to the bed of Cross Lake. The crisis which the city water system faced was apparently widely recognized in Shreveport. At the polls on November 11, 1919, city taxpayers approved the \$400,000 bond issue against only token opposition: 292 (\$4,090,000) for; 26 (\$513,673) against. [91]

Chester & Fleming were retained by the city in March 1920 to supervise design and construction work funded by the 1919 bond issue. [92] Since the firm was quite familiar with Shreveport's situation, specifications were quickly prepared, and as early as April some major items were let out for bids. [93] Construction was well underway before the end of the year.

One of the most critical deficiencies of the McNeil Street Station in the early twentieth century was its clear water well. Chester observed in 1919 that nothing was more "niggardly" provided during the reconstruction of the plant in the 1900-1901 period than clear water storage. [94] Because of its small capacity, the 1901 clear water well did not provide a reserve of filtered, pure water for pumping into the mains during peak loads or emergencies (fires, filter or sedimentation basin breakdowns, etc.). The construction of a more adequate clear water well was thus a major priority for meeting the city's impending water crisis. Bids were let for a 3 million gallon clear water well in April 1920. [95] It was constructed northwest of the pump station building and was completed before the year was out. [96]

Another urgent matter was enlargement of the station's pumping capacity. This required not only buying new steam pumps, but also enlarging the McNeil Street Station, since there was no room for additional pumping units in the old structure. The Council authorized bids for new pumping engines in April 1920 and bids for the enlargement of the pumping station in January 1921. [97] Enlargement of the station required massive modifications to the old low service pumping room. Its roof was raised and the room enlarged from around 30 by 32 feet to around 50 by 80 feet. The room which resulted still contained the old 1898 Worthington vertical, triple expansion, low service steam pump. But two other engines were added. North of the 1898 Worthington's pump pit, Chester & Fleming supervised construction of a second pump pit which was linked by tunnel to the old raw water receiving well on the bayou. A new 5 mgd Worthington vertical, triple expansion, low service pump was installed in this pit. (See HAER photos LA-2-42 to LA-2-45 for views of this engine.) West of the two low service vertical pumps, in the center of the new pumping room, Chester & Fleming supervised erection of another new steam pumping engine, a 5 mgd Worthington-Snow horizontal, cross-compound, crank-and-flywheel duplex. (See HAER photos LA-2-51 to LA-2-55 for views of this engine.) Room for an additional unit of the same type was provided at the western third of the new pump room, but this space was reserved for future expansion. [98] The boiler plant was also modified. Oil burners were provided so that the boilers could easily and quickly be converted from natural gas to oil. [99] (See Appendix I and HAER drawings, sheets 5,7,8 and 10 of 10 for the plant as it appeared after 1921.)

In addition to new pumping engines, an enlarged pump house, and a new clear water well, the proceeds of the 1919 bonds were also used to install larger force mains running from the station to the business district. These modifications solved the most immediate needs of the city's water system quite well. The Commissioner of Public Utilities boasted in 1922 that the McNeil Station was one of the "handsomest and most substantial structures of its kind in the entire country" and that the plant as a whole ranked "with the best in the whole country." He also noted that while water pressure at the edge of the city had previously been only 20 pounds, it was now 65. [100] Outside parties agreed. In 1923 the National Board of Fire Underwriters reported that Shreveport's water system was in "first class shape." [101]

CONSTRUCTION OF THE CROSS LAKE RESERVOIR

As preparations were being made to begin enlarging McNeil in the spring of 1920, the Council also took further action on Cross Lake, instructing the Mayor (John McW. Ford) to inform the governor that the city had complied (or was complying) with the terms of Act 31 of 1910. [102]

Opposition to the use of Cross Lake, however, was still alive. In October 1920, in an effort to stop the Cross Lake project before further expenses were actually incurred, the head of the city's Board of Health, G.C. Chandler, submitted to the Council a petition requesting a referendum to fix the Red River as the permanent source for the city's water. [103] The Council, already committed to Cross Lake, was reluctant to accept Chandler's petition and soon found reason to reject it. The city's attorney, after studying the petition, informed Leon Kahn, then Commissioner of Public Utilities and one of the strongest advocates of the Cross Lake project, that it was not in proper form. [104] A close check indicated that it contained only 353 qualified names; 485 were required to compel the Council to call a referendum. Moreover, the city's attorney indicated that he felt it was "improper and unreasonable" to restrict the city to one special source of water supply and that the choice of water supply was an administrative matter and not subject to referendum. [105] Accepting these arguments, the Council refused to act on Chandler's petition. Chandler attempted to find redress through the courts, but they accepted the city's arguments and denied Chandler's request for a writ of mandamus. [106]

Leon Kahn, the Commissioner of Public Utilities, used the row over Chandler's petition to urge the Council to push the matter of clearing up land ownership problems in Cross Lake. On November 9, 1920, at Kahn's urging, the Council authorized the Mayor, the Commissioner of Public Utilities (Kahn), and the City Attorney to "take steps" to get certain Cross Lake properties deeded to the city by the U.S. government. [107] Even though the ten year limit for the use of Cross Lake granted by the state legislature expired in 1920, it was clear that the city did, in fact, intend to make use of the bed of Cross Lake as a reservoir and that only problems of securing title and raising money were hindering the project. Thus the state legislature, at the city's request, extended the length of the city's option to the lake bed to July 1, 1926, [108] and the governor of Louisiana informed Mayor Ford in December 1921 of his intention to protect the city's claim to the lake by refusing further applications for mineral leases. [109]

Ownership of the lake bed, however, continued to be a major headache to the Council. As previously noted, Cross Lake was navigable in 1812, when Louisiana was admitted to the union and granted the lands under all navigable bodies of water. By 1852, with the partial removal of the great raft (or log jam) on the Red River, however, the waters backed up into Cross Lake had begun to recede. By 1872 the lake was no longer navigable, and much of it had dried up. Squatters had moved in and settled where the waters had been. Some of these squatters felt they had a solid claim to the lands since in the 1837-1838 government survey of the lake 2500 acres had been erroneously omitted, and, under public land laws, were, therefore, open for settlement.

The picture was further complicated by a Congressional land grant. In 1856 Congress had granted the Vicksburg, Shreveport, & Texas Railroad (later the Vicksburg, Texas & Pacific Railroad) unappropriated land in every odd numbered section within 6 miles of its right-of-way. Slightly over 1000 acres of the lands claimed under this grant were in the old bed of Cross Lake, and, making matters worse, this claim had been accepted by the state in the 1850s. Finally, there were several areas in the bed of Cross Lake that had been islands in 1812 and were legally still the property of the United States government. Thus, when Shreveport in 1920 began to try to clear up all liens and claims against its title to the lake bed, the matter proved to be far more complicated than initially suspected. [110]

In late 1920 or early 1921 the city asked the United States Department of the Interior to clear up the question of who owned the bed of Cross Lake -- the city (via the State of Louisiana), the squatters, or the railroad. Further, in 1922 the city asked the Department of the Interior to survey the "alleged unsurveyed lands" claimed by the squatters, as well as the ten unsurveyed "islands" above the 1812 water level (172.0 feet, Gulf datum), and to determine the 1812 shoreline. [111] The Interior Department carried out this work, and on October 28, 1922, ruled that all lands below 172.0 feet (Gulf datum), the water line in 1812 had been granted to the State of Louisiana and, therefore, now belonged to the city of Shreveport. [112]

In March 1923 the new Commissioner of Public Utilities, W.T. Mayo, introduced a resolution, approved by the City Council, authorizing the Mayor to file any suits deemed necessary to secure for the city unchallenged title to the lands of Cross Lake. [113] In subsequent months the city filed more than thirty suits against "trespassers" who claimed lands in the lake bed. [114]

There was other evidence of the Council's determination to press through with the Cross Lake project. In July 1923 it called a bond election for October 23, 1923, seeking authorization to issue another \$1,000,000 in bonds, roughly 80% of the proceeds to be used to convert the bed of Cross Lake into a reservoir, the remaining portion to be used for further improvements at McNeil Station. [115] The bond election of October 23, 1923, was another resounding victory for the supporters of the Cross Lake supply: 694 (\$9,084,031) voted for; only 177 (\$1,054,765) voted against the bonds. [116]

The improvements made at McNeil with the proceeds of the 1923 bonds completed the modifications suggested in the 1919 Chester & Fleming report. Between 1924 and 1926, for instance, the old settling basins were completely remodelled. Their inclined sides were replaced with vertical walls, and their flat bottoms were replaced with bottoms which sloped to a single point for ease of flushing during cleaning. Another difficulty with the old sedimentation basins had been inadequate facilities for mixing chemicals with the raw water. The new settling basins were equipped with new aerators and a mixing chamber with vertical baffles to correct this deficiency. (See HAER photos LA-2-20, LA-2-78 and LA-2-79 for views of the new aerators and settling basins.)

At the same time, the filter plant at McNeil underwent major modifications. Four new 750,000 gpd rapid sand filters were added, and the

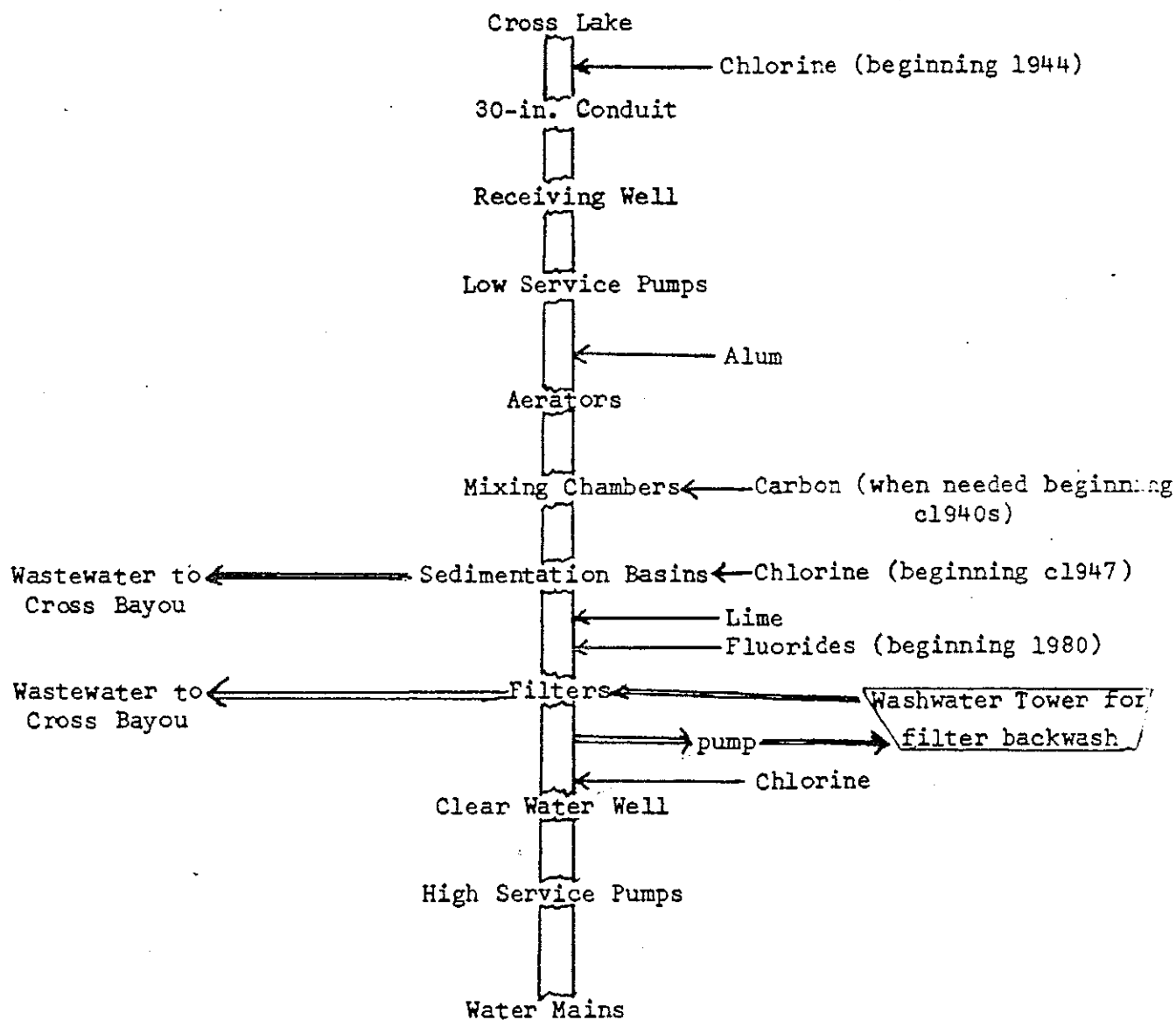
northeast extension of the filter wing lengthened by around 35 feet to house them (see Appendix I). At the same time the twelve older filters were completely overhauled, provided with new loss of head and rate control gauges, and converted from manual to hydraulic operation. Moreover, the backwash process was modified. Previously filters had been directly washed from the high pressure mains. At Chester's suggestion, the city installed an elevated 65,000 gallon washwater tank directly over the old clear water well to provide water for backwashing. A circular building, housing a chlorinating room (equipped with a new vacuum feed chlorinator) and a new laboratory, was installed directly beneath the new wash water tank and above the old clear water well. (See HAER photos LA-2-14 and LA-2-16 for a view of the McNeil Station after these additions had been made; see also HAER drawings, sheets 5-6 of 10.)

The pump station building was modified as well. A new slate and steel roof was installed over the boiler room. McNeil's original wooden floors in the pumping and filter rooms, long considered a serious fire hazard, were replaced with concrete floors. Finally, the station was equipped with new dry feed chemical machines for lime and alum, eliminating the large cypress tanks and their bevel gear driven agitators, used for years to prepare chemical solutions in the plant. With these modifications the McNeil Pumping and Purification Station assumed the basic outlines it still retains today (1980). The flow diagram of Table 17 outlines how water was processed in the plant. [117] (See HAER drawings, sheets 4-6 of 10.)

After the passage of the October 1923 bond issue, the Council not only authorized further improvements to McNeil, but also began to campaign more vigorously to secure clear title to Cross Lake, since 80% of the proceeds of those bonds were to be used to convert it into a municipal water reservoir. In November 1923 the Mayor was authorized by the City Council to employ lawyers to assist the city's attorney in prosecuting and defending all suits instituted, pending, or threatening on the Cross Lake properties. [118] Shortly after, the Council authorized surveys of Cross Lake to establish water lines (the boundaries of the city's claim), [119] and authorized the Mayor to retain J.N. Chester Engineers, the successor firm of Chester & Fleming, to draw up plans and specifications and superintend the construction of the projected reservoir. [120] These plans were submitted to the Council in late July 1924 and accepted. Since these plans involved the use of the existing Kansas City Southern Railroad embankment as a dam, the Mayor in July was also authorized to negotiate with the railroad for permission to use this embankment and for permission to construct a concrete spillway under its trestle across Cross Bayou. [121] Agreement was quickly reached. [122] Bids for clearing the lake, reinforcing the embankment, constructing the spillway and building a new railroad bridge overhead, and laying a pipeline or conduit from the new reservoir to the McNeil Street Station were opened in mid-August. [123]

With actual construction work on the Cross Lake project pending, Shreveport in 1924 began to finally clear away some of the last troublesome land ownership problems. In January, at the behest of the city, a bill was introduced into Congress authorizing transfer of the 1812 "islands" in Cross

Table 17: Flow Diagram: The McNeil Street Station 1926 to 1980



Lake to the city at a price of \$1.25 per acre. [124] In July 1924 the Council authorized the Mayor to attempt to acquire title to these lands under public land law. [125] And in January 1925 the city formally made application and purchased the lands in accordance with the act passed by Congress. [126]

In September 1924, as the bed of Cross Lake was already being cleared of underbrush and trees, the Council authorized the Mayor to offer \$7500 to the Railroad Lands Company, which claimed title to certain tracts in the bed of Cross Lake through the Vicksburg, Shreveport & Pacific Railroad's 1856 land grant, for its holdings to avoid a long court fight. [127] This offer was accepted, and the purchase formally approved by the Council in October. [128] The troublesome squatters remained. Some had been farming the bed of Cross Lake for nearly fifty years and intended to fight the city's claims in the courts as long as possible. Between July and October 1924 Shreveport settled with several of the contestants through land exchange. [129] The last three claims were settled out of court through cash payments in March 1925. [130]

Work began on the Cross Lake project in August 1924, while litigation was still pending. [131] More than 4000 acres in the lake bed were cleared of underbrush and trees by a local contractor. At the same time construction began on the dam. Following the suggestion made by the City Engineer in 1909, and seconded by the 1919 Chester & Fleming study, the existing embankment of the Kansas City Southern Railroad was utilized. The entire 8000 foot long, 27 foot high embankment, however, had to be reinforced with impervious fill (clay taken from the lake bed) and covered with 10 inches of rip rap (graded stone) to prevent erosion from wave action. A 225 foot long concrete dam and spillway were constructed where Cross Bayou left the Cross Lake bed and passed under a Kansas City Southern Railroad trestle. The dam and spillway backed water up into Cross Lake's old bed at an elevation of 168 feet (Gulf datum). The lake it created was 8 miles long, 1 to 3 miles wide, had 40 miles of shoreline, and covered around 10,000 acres. Averaging 8 feet in depth, it was capable of storing 20 billion gallons of water when completed in 1926. [132]

To carry water from this reservoir to the pumping and purification station at McNeil, Chester's engineer supervised construction of a 3 mile long, 30-inch diameter conduit. This conduit was of mixed construction. The first mile was cast iron, the last 2 miles concrete. Chester had favored an all cast iron line, but, in an attempt to reduce costs, the city had elected to take a cheaper alternative. [133] Operating solely by gravity flow the new conduit was to deliver 10 mgd to the pump station.

Work proceeded rather rapidly after legal problems were cleared up. Local contractors had begun clearing the bed of Cross Lake in August of 1924. [134] By November of 1925 Amiss was able to report that the project was 95% complete. [135] Heavy rains in November quickly filled the reservoir. [136] The conduit from Cross Lake to McNeil was completed in January 1926, and water was turned into it on January 19. [137]

Although the new supply was "turned on" on January 19, 1926, the Council scheduled the "Grand Opening" and "Dedication" ceremonies for

January 30. Then, with elaborate ceremony, speakers involved in the conception and fulfillment of the Cross Lake project lauded their accomplishments. Incumbent Mayor L.E. Thomas, for example, noted that the reservoir had cost the city only around \$30 per million gallons of storage, while other cities undertaking similar projects had paid \$400 to \$500 per million gallons. "We have the cheapest water supply that has ever been provided for any city," he boasted. [138] This was an exaggerated picture of the accomplishment, but not one exaggerated greatly. John T. Campbell, chief engineer of the J.N. Chester engineers, had presented a more accurate picture of the accomplishment in an interview some weeks earlier. Campbell noted that many cities spent four to five times more money for a less adequate supply and that of the projects supervised by his firm, he had never seen a water supply obtained at such a low cost. [139]

The early response of consumers to the new supply was favorable. The Commissioner of Public Utilities in his 1925-1926 biennial report observed that laundries, hotels, restaurants, and industrial plants, as well as domestic users, were reporting "vast savings," especially in the use of soaps. [140]

To protect the new water supply the Council on January 12, 1926, passed a comprehensive sanitary ordinance. Spitting, urinating, and defecating in Cross Lake were declared illegal. And to insure that none of these acts contaminated city drinking water, camping, swimming, bathing, wading, and seining were prohibited in the lake area. Other sections of the ordinance prohibited the erection of any privy, cesspool, toilet, or bathtub which would eventually drain into Cross Lake and totally prohibited the location of stables and slaughter houses in the Cross Lake watershed. [141]

These rather stringent regulations were probably prompted by the city's previous history of water quality problems. But strict adherence to these regulations, together with the ever-present problem of money, led to neglect of another of the recommendations made by J.N. Chester in 1919. Chester, in arguing for the Cross Lake reservoir, had pointed out that the reservoir had the potential of being used for more than just a water supply. He regarded it as "being suitable for a great pleasure park" which would "add tremendously to the already happy living conditions" of the city. [142] This suggestion was, initially, accepted by some members of the city government. In their digest of Chester's report Kahn and Lilley asserted:

There will be a strip of land over a quarter of a mile wide around the entire lake which may be made a beautiful pleasure ground with a driveway, 30 miles long, and where boating, fishing, picnicing, and general recreation may be enjoyed under strict sanitary regulations. [143]

This hope was still extant when Cross Lake was completed in 1926, for incumbent Mayor L.E. Thomas talked of constructing a scenic boulevard around

the lake with money from the Caddo Parish Police Jury (the chief "county" governmental body). [144] But, apparently, the police jury was unwilling to finance the venture. This refusal, and the difficulties posed by the Council's strict sanitary regulations, deterred development of the "pleasure park" idea and left the issue of Cross Lake's recreational potential a dormant issue.

1. Shreveport Department of Water and Sewerage, Bulletin No. 1 [Annual Report for the Year 1917], 1917, pp. 3, 6, 7. (Hereafter cited as Shreveport Department of Water and Sewerage, 1917 Report.)
2. Amiss, "History of Shreveport Water Department," South-West Waterworks Association Convention, Shreveport, Louisiana, October 1926, Souvenir Booklet, p. 23
3. Journal, September 18, 1916.
4. Shreveport Department of Water and Sewerage, "Fifth Annual Report, 1921," in Shreveport City Council, Minutes, July 11, 1922.
5. Shreveport Department of Water and Sewerage, 1917 Report, p. 2.
6. Ibid., and Shreveport City Council, Minutes, January 23, 1917 (authorization for purchase).
7. Shreveport Department of Water and Sewerage, Second Annual Report . . . for the Year Ending December 1918 [Bulletin No. 2] p. 10. (Hereafter cited as the 1918 Report.)
8. Ibid., p. 13.
9. Ibid., pp. 13-14.
10. See, for summary, Shreveport Department of Water and Sewerage, 1917 Report, pp. 2-3.
11. For example, the Journal in an editorial on January 2, 1917, declared that with municipal ownership the city was not likely to get better water or more water, but should get cheaper water.
12. Shreveport City Council, Minutes, April 24, 1917. Even before the Council meeting Mayor Ford had announced that there would be no change in the rate structure (Journal, January 3, 1917).
13. Shreveport City Council, Minutes, April 24, 1917.
14. Journal, January 1, 1917. See, for example, the favorable comment by L.C. Bulkley, the leader of the drive for municipal ownership in Times, August 8, 1914.
15. Shreveport City Council, Minutes, February 19, 1918. The Council thanked Goss for "efficient and faithful service."
16. Shreveport Department of Water and Sewerage, 1918 Report, pp. 1-2.
17. For a biographical sketch of Amiss see McLure, History of Shreveport, p. 384, and J. Fair Hardin, Northwestern Louisiana: A History of the Watershed of the Red River, 1714-1937, v. 2 (Louisville, Kentucky, and Shreveport, 1937) pp. 262-263.

18. "Burst Mains and Wooden Shingles Spread Fire Over Nine Blocks," Fire and Water Engineering, v. 78 (1925) p. 739. Amiss' explanation for the cause of the rupture appeared in a later issue of the journal: Amiss, "What Caused the Joints to Break in the Shreveport Mains," ibid., pp. 804-805.
19. Shreveport Department of Water and Sewerage, 1918 Report, pp. 4, 6.
20. Ibid., pp. 7-8. Also, Chester & Fleming, "Report," 1919, p. 11 and display 3, and Shreveport City Council, "Water Supply for Shreveport, Louisiana: A Digest of the Report of Chester & Fleming . . .," 1919, p. 15.
21. Shreveport Department of Water and Sewerage, 1918 Report, pp. 2, 7-8.
22. Ibid., 1917 Report, p. 10, for example, notes that the plant "can not well be expanded at this time."
23. Ibid.; Shreveport City Council, Minutes, December 26, 1917.
24. For example, Journal, January 3, 1917.
25. Shreveport Department of Water and Sewerage, 1917 Report, p. 4, and 1918 Report, p. 2.
26. Ibid., 1918 Report, p. 3.
27. Ibid., pp. 2-3.
28. Shreveport City Council, Biennial Report, 1925-1926, p. 63.
29. Shreveport Department of Water and Sewerage, 1918 Report, pp. 2, 17.
30. See, for instance, Kahn's complaint in ibid., p. 2.
31. Shreveport Department of Water and Sewerage, "Fifth Annual Report, 1921," in Shreveport City Council, Minutes, July 11, 1922.
32. Shreveport Department of Water and Sewerage, 1918 Report, pp. 17-19. There are two drawings in the Shreveport Department of Water and Sewerage collection dated November 1917 and February 1918 which deal with this modification to the syphon line.
33. Shreveport City Council, Biennial Report, 1923-1924, p. 59.
34. See, for example, Kahn's comments in the Shreveport Department of Water and Sewerage, 1917 Report, p. 13.
35. Ibid., 1918 Report, pp. 12-13, 16. On seventeen days in 1918 tests for B. Coli were positive. Ten of these days were in November when raw water had to be pumped into city mains (pp. 12-13).

36. In addition to the comments of Earl and Elbridge below (in Shreveport City Council, Minutes, September 4, 1917), this impression was also supported by conversations with a number of the city's older residents.
37. Shreveport City Council, Minutes, September 4, 1917.
38. Ibid., November 8, 1919.
39. See the report from George Earl to Leon Kahn, incumbent Commissioner of Public Utilities, in Shreveport City Council, Minutes, September 4, 1917 (Earl's letter is dated August 31, 1917).
40. Ibid., November 8, 1919.
41. Ibid., September 4, 1917 (report from Guy Elbridge and George Earl).
42. The background to Shreveport's development of Cross Lake as a water supply is also covered by Lowin Humphrey, "A History of Cross Lake: 1883-1926," North Louisiana Historical Association, Journal, v. 9 (Summer 1979) pp. 84-97.
43. Times, June 7, 1931 (remarks by Chester); see also Times, January 31, 1926 (comment by W.T. Mayo) and Journal, January 30, 1926 (comment by W.T. Mayo).
44. This is according to Mayor L.E. Thomas in recounting the history of the Cross Lake project in 1926 (Times, January 31, 1926).
45. According to Lowenthal's resolution in Shreveport City Council, Minutes, August 3, 1909.
46. Ibid., July 9, 1907 (Blanchard's report).
47. Ibid.
48. Ibid., January 12, 1909.
49. Ibid., July 13 and August 3, 1909.
50. Ibid., August 3, 1909.
51. Times, July 2, 1978 (Orland Dodson, "A History of Cross Lake"); Times, March 1, 1911 (article on Caddo Levee Board); Humphrey, "Cross Lake," pp. 92-93.
52. Journal, January 29, 1926 (remarks by L. Butler at the Cross Lake dedication ceremony).
53. Shreveport City Council, Minutes, April 19, 1910.
54. Journal, January 29, 1926 (Butler's remarks at Cross Lake dedication).
55. Shreveport City Council, Minutes, July 12, 1910.

56. Times, July 2, 1978 (Dodson, "Cross Lake").
57. Shreveport City Council, Minutes, July 12, 1910.
58. Shreveport Chamber of Commerce, Executive Committee, Minutes, June 19, 1911.
59. Shreveport City Council, Minutes, February 10, 1914.
60. Ibid., September 11, 1912; Times, September 12, 1912.
61. Shreveport City Council, Minutes, January 2, 1913.
62. Times, August 31, 1915 (Lynn's remarks), and July 12, 1911 (editorial).
63. Times, September 2, 1915 (Bulkley); August 7, 1914 (Pugh's comments).
It should be recalled that the city's health officer, Blanchard, had favored the use of the Red River in 1907 (see note 46 above).
64. Times, July 12, 1911.
65. Shreveport City Council, Minutes, March 5, 1913; Journal, March 6, 1913.
66. Times, October 22, 1913.
67. Shreveport Chamber of Commerce, Board of Directors, Minutes, June 10, 1913.
68. Shreveport City Council, Minutes, November 28, 1913.
69. Ibid., May 22, 1914.
70. Ibid., May 26, 1914.
71. Ibid., March 23, 1915.
72. Shreveport Chamber of Commerce, Board of Directors, Minutes, March 29, 1915.
73. Shreveport City Council, Minutes, December 7, 1915.
74. Chester & Fleming, "Report," 1919, pp. 25-26.
75. Shreveport Department of Water and Sewerage, 1917 Report, p. 13. Kahn also recommended an expansion of the McNeil Street Station and retaining skilled engineers for the purpose (p. 12).
76. Biographical data on J.N. Chester are from John W. Leonard, ed., Who's Who in Engineering, 1922-1923 (New York, 1922) p. 260. For the firm's record see Times, January 31, 1926. Chester claimed to have been the first to advocate the use of steel over wood tubs for filters (J.N. Chester, "Modern Filter Practice - Discussion," American Water Works Association, Proceedings, 1913, p. 396).

77. Chester & Fleming (Hydraulic and Sanitary Engineers, Pittsburgh, Pennsylvania), "Report on Water Supply for City of Shreveport, Louisiana," March 1919, pp. 11-12; Shreveport City Council, "Water Supply for Shreveport, Louisiana: A Digest of the Report of Chester & Fleming, C.E., Pittsburg, Pa.," pp. 5, 16-17.
78. Chester & Fleming, "Report," 1919, pp. 13-14; "Digest," pp. 5, 17. The quote comes from the latter source.
79. Chester & Fleming, "Report," 1919, p. 16; "Digest," pp. 5, 18.
80. Chester & Fleming, "Report," 1919, pp. 16-17; "Digest," p. 18.
81. Chester & Fleming, "Report," 1919, pp. 17-22; "Digest," pp. 5, 18-20.
82. Chester & Fleming, "Report," 1919, pp. 22-27; "Digest," pp. 5-6, 20-23.
83. Chester & Fleming, "Report," 1919, pp. 28-29, 36-37; "Digest," pp. 7-8, 23.
84. Chester & Fleming, "Report," 1919, pp. 28-34; "Digest," pp. 8-10.
85. Shreveport City Council, Minutes, March 25, 1919.
86. Ibid., March 25, 1919.
87. Ibid. The complete citation of the booklet issued by the Council (24 pages long) is in note 77 above.
88. Ibid., August 18, 1919.
89. Ibid., May 15, 1919; "Digest," p. 11.
90. Shreveport City Council, Minutes, September 23, 1919.
91. Ibid., November 12, 1919; Journal, November 12, 1919.
92. Shreveport City Council, Minutes, March 2, 1920.
93. Ibid., April 27, 1920.
94. Chester & Fleming, "Report," 1919, p. 8.
95. Shreveport City Council, Minutes, April 27, 1920.
96. Shreveport Department of Water and Sewerage, Drawing 469-24 (November 1919).
97. Shreveport City Council, Minutes, April 27, 1920; January 25 and February 25, 1921.
98. For the enlargement of the pump house see the November 1919 drawing in Shreveport Department of Water and Sewerage drawing collection (the number on the drawing is missing).

99. The additions and modifications that were made in the McNeil Station are summarized in the "Fifth Annual Report, 1921" of the Department of Water and Sewerage in Shreveport City Council, Minutes, July 11, 1922. See also Amiss, "Shreveport Completes New Water Works Improvement Program," Water Works Engineering, v. 84 (1931) p. 1669.
100. "Fifth Annual Report, 1921" of the Water Department in Shreveport City Council, Minutes, July 11, 1922.
101. Shreveport City Council, Biennial Report, 1924-1925, p. 57.
102. Shreveport City Council, Minutes, May 11, 1920.
103. Ibid., October 13, 1920.
104. Ibid., October 26, 1920.
105. Ibid., November 23, 1920.
106. "Important Shreveport Decision," Fire and Water Engineering, v. 69 (1921) pp. 940, 950.
107. Shreveport City Council, Minutes, November 9, 1920.
108. Times, January 31, 1926 (L.E. Thomas' sketch of the history of the Cross Lake project); Journal, January 29, 1926 (article by Lewell Butler).
109. Shreveport City Council, Minutes, December 13, 1921.
110. For a summary of the legal complications see George R. Wickham, Acting Commissioner, to General Land Office, Secretary of the Interior, October 18, 1922. This ten page letter outlines the legal complications encountered by the city in its attempt to secure ownership of the bed of Cross Lake. A copy is in the Charles B. Foster Collection of Louisiana State University in Shreveport Archives. See also Humphrey, "Cross Lake," p. 93, and Shreveport City Council, Minutes, October 14, 1924.
111. Wickham to General Land Office, October 18, 1922.
112. Times, January 31, 1926 (Thomas' sketch of the history of the Cross Lake project).
113. Shreveport City Council, Minutes, March 27, 1913.
114. Times, January 31, 1926 (Thomas' remarks).
115. Shreveport City Council, Minutes, July 24 and August 14, 1923.
116. Ibid., October 3, 1923; Journal, October 3, 1923.

117. The improvements carried out with the 1923 bond issue are summarized in Shreveport City Council, Biennial Report, 1923-1924, pp. 62-63, and 1925-1926, pp. 53-67 passum (especially p. 62); Amiss, "Shreveport Completes Program," p. 1669; and "Shreveport, La., Project Nearly Completed," Fire and Water Engineering, v. 78 (1925) p. 1157. See the Shreveport Department of Water and Sewerage drawing collection, drawings 469-70 and 469-78 (February 1924 and May 1924, extension of the filter house); drawing 469-76 (May 1924, aerators and mixing chamber); drawing 469-77 (May 1924, lab and washwater tower), and other miscellaneous drawings in that collection.
118. Shreveport City Council, Minutes, November 2, 1923.
119. Ibid., November 13, 1923.
120. Ibid., November 28, 1923.
121. Ibid., July 23, 1924.
122. See "Agreement between City and Kansas City Southern Railroad" and "Conference Held between City Council and Water Board of Shreveport and the Kansas City Southern Railroad" (transcript) in the Charles B. Foster Collection in the LSU in Shreveport Archives for the issues negotiated. There is also a May 20, 1924, letter from J.N. Chester to W.T. Mayo, the Commissioner of Public Utilities, suggesting clarifications to the contract between the city and the KCSRR.
123. Shreveport City Council, Minutes, July 22, 1924.
124. United States Congress, 68th, 1st Session, Union Calendar no. 141, H.R. 5573, introduced January 16, 1924, reported with amendments March 21, 1924 (copy in Charles B. Foster collection).
125. Shreveport City Council, Minutes, July 9, 1924.
126. Ibid., January 27, 1925.
127. Ibid., September 25, 1924.
128. Ibid., October 24, 1924.
129. Ibid., July 9 and October 28, 1924.
130. Ibid., March 12, 1925.
131. Journal, January 30, 1926.
132. Chester & Fleming, "Report," 1919, display 10 (detail of embankment modification); Amiss, "History of Shreveport Water Department," in O'Pry, Chronicles of Shreveport, pp. 199-200; "History of Shreveport Water Department," South-Wester Waterworks Convention, Souvenir Booklet, p. 19; "History of Shreveport Waterworks," Southwest Water Works Journal, v. 27 (October 1945) p. 35; "Shreveport Completes Program," pp. 1669-1670.

133. Shreveport City Council, Minutes, September 24 and November 6, 1924.
134. Journal, January 30, 1926.
135. "Shreveport, La., Project Nearly Completed," Fire and Water Engineering, v. 78 (November 18, 1925) p. 1157.
136. Journal, January 30, 1926, and Shreveport City Council, Biennial Report, 1925-1926, p. 60.
137. Journal, January 19, 1926.
138. Times, January 31, 1926; Journal, January 30, 1926.
139. Journal, January 19, 1926.
140. Shreveport City Council, Biennial Report, 1925-1926, p. 60.
141. Shreveport City Council, Minutes, January 12, 1926.
142. Shreveport Department of Water and Sewerage, 1918 Report, p. 5 (see also, Chester & Fleming, "Report," 1919, p. 23).
143. "Digest," p. 6.
144. Journal, January 19, January 29, and January 30, 1926.

CHAPTER V

GRADUAL OBSOLESCENCE:

The McNeil Station and Shreveport's Water Supply After 1926

The construction of the Cross Lake reservoir was probably the single most important event in the history of Shreveport's water supply system. It provided the city, according to one prominent water works engineer, with one of the ten best water supplies in the country. [1] The water was soft and pure from a sanitary point of view. It was also abundant. Commissioner of Public Utilities W.T. Mayo predicted in 1919 that Cross Lake would have a volume sufficient for a city of 300,000 people, far more than the city had in 1926. [2] Because Cross Lake water was so abundant, it afforded the city a period of complacency, an era in which the Council and Water Department did not have to worry, as they had had to do for years, about the pressing need for a new supply of water. Thus from 1926 and 1954 the complicated and difficult task of seeking new supplies of water was largely ignored. Only the more mundane problems of expanding pumping and purification facilities to handle the city's increasing water demands required occasional attention and action.

THE McNEIL STREET STATION IN THE POST-1926 ERA

Shreveport's water consumption jumped very sharply after the introduction of Cross Lake water. In 1925 average daily pumpage had been only 5.11 mgd, up less than 1.3 mgd from 1918. By 1927 the average daily consumption had already jumped 0.88 mgd to 5.99 mgd, and quickly went higher. In 1928 consumption hit 6.78 mgd, and in 1929 it was 8.23 mgd. [3] Two factors contributed to the increased consumption -- a modest rise in per capita use and an enormous increase in the city's population. [4] [See Appendix IV for population data.] Some City Council members had hoped that the Cross Lake supply would encourage small towns on the outskirts of Shreveport to request incorporation to take advantage of the city's superior water. [5] Their expectations were not disappointed. Cross Lake's water was the major factor which led to the annexation of the towns of Cedar Grove, South Highlands, and Broadmoor in the late 1920s. These annexations and natural growth boosted the city's 1930 population to 76,765, 75% higher than the 1920 figure.

This rapid growth compelled the Water Department to increase its pumping capacity at McNeil very soon after Cross Lake was brought into the system. Space for such an expansion had been provided at the west end of the new pump house during the 1920-1921 modifications, and Superintendent Amiss, after reading of a used 8 mgd steam pumping engine being offered for bids by the Tulsa water works, saw an opportunity to add a new engine at minimum

cost. [6] In early 1927 Amiss entered a bid of \$15,000 for the city on a 1911 Allis-Chalmers horizontal, cross-compound, crank-and-flywheel duplex steam pump. [7] The bid was successful and Tulsa, with considerable pleasure, accepted Shreveport's offer. The only other bid for the engine had been only \$5000. [8] (See HAER photos LA-2-57 to LA-2-59 for views of this engine.)

The bargain proved to be more expensive than anticipated. In May 1927 Amiss asked Tulsa officials if they would deduct \$500 to \$1000 from the price because defects had been discovered in the bearings of the engine when it was disassembled. [9] This request did not meet with a favorable response from Tulsa. Installation costs were also high. Although the city purchased the engine for only \$15,000, total costs to install and make the engine operative reached \$42,000. In 1930 the purchase was criticized, but Amiss defended it, arguing that the cost of an equivalent new engine would have been in excess of \$64,000 and that the engine's perfect operation between 1927 and 1930 was proof that the machine was fundamentally sound. [10]

While the new pumping engine gave the McNeil Station adequate pumping capacity, other elements in the system were insufficient to meet the rapidly growing water needs of the city, especially since the City Council had agreed to supply water to Bossier City, across the Red River, and the air base being planned near Bossier City (Barksdale). [11] Both the purification facilities at McNeil and the conduit leading water from Cross Lake to McNeil were operating dangerously close to capacity on heavy water demand days by the late 1920s. [12]

Since a solution to this problem largely involved expanding equipment instead of seeking a completely different water supply, the city was able to act quickly and decisively on the matter. In early 1929 the Council retained the J.N. Chester Engineers to study the situation. Chester reported back quickly. [13] He found that the existing steam pumps at McNeil were "in good shape" and asserted that they could be depended on "for years to come." But Chester reported that by 1935 the city's existing pumping and filtering facilities would be operating beyond safe capacity if water consumption continued to grow at present rates. The most severe deficiencies in the system, he declared, were in the raw water conduit from Cross Lake and McNeil's purification equipment. With natural gravity flow the raw water conduit could deliver, at best, only 10 mgd. The McNeil plant's seven oldest filters (those installed in 1890 and 1900-1901) were fast approaching the end of their useful life, and the five oldest concrete filters (installed in 1904-1905 and 1910-1911) were in need of considerable repairs. And, even if they were repaired, the existing filter plant could not continue for long to satisfy the city's needs.

Chester analyzed two options: (1) erection of a new plant to supplement McNeil on Cross Lake, and (2) enlargement of the McNeil plant with the addition of a second raw water conduit from Cross Lake. A third possible option -- construction of a completely new plant on Cross Lake and the retirement of McNeil -- was ruled out from the first. The expenses incurred in enlarging McNeil in 1920-1921 and 1924-1925 made it uneconomical, especially since the McNeil plant would retain certain advantages over any new plant located at Cross Lake, the most important being close proximity to the congested central area of the city.

This left the other options -- enlargement of McNeil or a supplementary pumping and purification plant on the shores of Cross Lake. Chester recommended the latter. A Cross Lake plant would be cheaper, since it would not require a new 3 mile long, \$250,000 to \$300,000 raw water conduit. Since the growth areas of Shreveport were at the extreme southern and western edges of the city, distant from McNeil but relatively near Cross Lake, a new plant would be able to better and more cheaply service the newer areas of town and provide for future service expansions. Finally, Chester pointed out that a new station would have the advantage of duplicating the older plant. Thus, if either of the plants failed in an emergency the other could provide back up. Chester recommended electric pumps for the new plant, finding that they were somewhat cheaper than the alternatives -- steam and gas engines.

The Council, which had previously accepted Chester's recommendations without question, balked slightly at the recommendation to build a completely new plant and voted 3 to 2 to refer the report to the City Engineer for his opinion. [14] The City Engineer, however, backed Chester's recommendation. [15] With this assurance the Council called an election for December 17, 1929, for authorization to issue \$500,000 in bonds. [16] In order to head off a possible taxpayer revolt, the bonds for this issue were to be secured by water revenue bonds, which involved mortgaging the properties and revenues of the water department, instead of general obligation property tax bonds, which involved mortgaging general tax revenues, the more usual course. This opened the election to all qualified voters, not just property tax payers. The issue was thus decided only by popular vote. Assessments were not cast. It passed 1500 to 451. [17] Specifications were quickly mailed and bids requested by February 20, 1930. [18]

The new facility, located on the shores of Cross Lake not too far from the spillway, had a capacity of 8 mgd, about the same as the McNeil Station. But it differed from the older plant in several respects. As already noted the pumps were electric rather than steam powered. Its filters were unhoused, an innovation which reduced construction costs and enabled the facility to make some use of sunlight and wave action in the purification process. More advanced settling basins with rotating booms were installed to speed up sedimentation. At the McNeil Station the only major modification made in 1930-1931 involved the addition of aerators to the clear water basin to remove carbon dioxide. [20] The new plant was formally opened on June 6, 1931. [21]

The construction of the Cross Lake Station was the beginning of the end for McNeil's pivotal role in the city's water supply system, for the Cross Lake plant was designed to handle any future expansions in the city's system. The intake, pump station building, and general piping at Cross Lake, for instance, were designed with an ultimate capacity of 24 mgd, and while the filters, mixing chambers, raw water reservoir, and the like were only designed for 8 mgd, they were constructed to accommodate additional units at the lowest possible cost. [22]

Because the major consumers of city water were still located in the district closest to McNeil, the older station with its steam pumping units, was not immediately replaced as the more important of the two installations. Even after

the Cross Lake plant was operative, McNeil continued to pump more water. For instance, on an average day in the late 1930s approximately 80% of all water pumped into the city's mains came from McNeil. [23] And as late as 1950 it continued to pump more than half of the city's water. [24]

McNeil's position as the city's most important pumping and purification station was undoubtedly lengthened by the great depression of the 1930s. The prolonged business and economic slump which began in 1929 significantly reduced the rate at which the demand for water had been growing. Both total and per capita consumption in Shreveport dropped. [25] The depression also encouraged the city to make maximum possible use of and take the best possible care of existing facilities, since little money was available for constructing new ones. Thus the old steam pumping engines and filters at McNeil were given extra special care. Every shift was expected to polish the steam engines and other metal parts in the station and keep the plant so spotless that inspection with white gloves would reveal no dirt. [26] When the gravity flow conduit line from Cross Lake to McNeil reached capacity, the city installed in 1930 a booster pumping station supplied by a suction line near the intake, increasing the conduit's capacity from 10 mgd to 13-15 mgd. [27] Later, in the 1940s, break-point chlorination was adopted near the beginning of the line to rid the conduit of growths which were inhibiting flow. [28] Steps like these enabled the water department to continue to use the McNeil facilities instead of expanding the pumping and filtration units at Cross Lake, a much more expensive option. Similarly, when the boilers which the city had installed in 1917 required replacement in 1938, the Water Department sought a cheaper option. The old boilers were completely disassembled and rebuilt. [29] The boiler of a locomotive driven up adjacent to the station was used to provide steam for the pumps while this work was carried out.

These stop-gap measures carried Shreveport's water supply system through the depression years. But by 1940 water demand once again had begun to approach the system's capacity. By 1940 average daily consumption was 10.2 mgd, but maximum demand was much higher, approaching 22 mgd, the ultimate capacity of the McNeil and Cross Lake stations combined. [30]

To study the matter Shreveport retained the prominent Kansas City public works consulting firm of Burns & McDonnell. [31] Burns & McDonnell analyzed three options for the city in 1941:

- A. Centralized purification at Cross Lake; continued divided pumpage to make use of McNeil's good proximity to the central city.
- B. Divided purification and pumpage; which involved continued use of the Cross Lake Plant, the ultimate retirement of the old McNeil Street Station, and the construction of an entirely new plant west of the old McNeil Station.
- C. Centralized pumping and purification at a completely new plant. [32]

Not surprisingly, none of these options gave the old McNeil Street Station the central position it had held in the city's water supply system since 1887.

Due to World War II none of the three Burns & McDonnell options were followed up. It proved easier and cheaper, when increased demands came, to increase purification at one or both existing locations, and increase pumpage at Cross Lake. Thus, in 1942 the city enlarged the purification facilities at McNeil by constructing a completely new filter building just west of the sedimentation basins and installing three new filters. These were supplied with water by syphon from the settling basins to avoid expensive plumbing. [33] At the same time the oldest set of filters in the old filter house were finally retired (the 1890 and 1900-1901 steel filters). But the filters added in 1942 were almost the last major additions to the old McNeil Street Station. After this, major expansion of the city's system was almost totally restricted to the Cross Lake plant. By the 1960s it had supplanted McNeil as the keystone of the city's water supply system, even though McNeil, with its old steam powered pumps and concrete filters, continued to make an important contribution. [34] (See HAER photos LA-2-78 and LA-2-80.)

The continued importance of the McNeil Street Station with its steam powered pumps may at first glance seem rather difficult to comprehend. Even before World War II electric powered pumping stations had begun to replace steam pumping stations like McNeil. The electric pumping plant installed at the new Cross Lake plant in 1930-1931 was a clear example of that trend. And the pace of replacement picked up rapidly in the two decades following World War II. By the 1960s most steam-powered pumping stations had been retired and scrapped. Yet Shreveport's McNeil Street Station continued in operation. It was, as noted, the central feature of the water supply system in Shreveport until the 1950s, and its steam pumping engines were to continue to play an important role until the end of the 1970s. By that time McNeil was probably the only large pumping station in the United States to have steam pumps in regular service.

A number of factors allowed the McNeil Street Station with its steam pumps to survive far beyond its time. As already noted, the depression and World War II, with the economic stringencies they brought, made it more advantageous to maintain existing plant than seek new equipment. But a more important factor was the location of the McNeil Station. Only around a mile from the heart of Shreveport's downtown business district, the McNeil pumping plant was ideally situated to respond quickly and provide good water pressure for fires. Time and again after 1930 the advantageous location of the McNeil Station saved the plant from being retired and relegated to the scrap heap. Time and again consulting engineers who may have preferred to recommend to the city a completely new centralized pumping and purification system were reluctantly forced to concede that the McNeil Station's proximity to the central business district was an asset which overruled the antiquated nature of the pumping machinery. [35]

Almost as important as this were the advantages of having dual stations with dual power sources. With electric pumps at Cross Lake and steam pumps at McNeil, Shreveport's water system was provided with a margin of safety above that available to most cities. If one plant was damaged, the other could continue to operate the system. Even in the event of a complete failure of electric power, the McNeil steam pumps were available to provide water for emergency purposes. [36] According to Charles B. Foster, who served in the Shreveport water system from 1939 to 1971 and was Superintendent of the system for nearly a decade, this was among the primary reasons both Amiss and he kept McNeil's steam pumping engines in operation. [37]

While the advantageous location and the dual power option provided by the McNeil Street Station were clearly among the most important factors which enabled it to survive well into the late twentieth century with its steam pumping engines intact and on line, there were other factors which contributed. The engines at the McNeil Street Station were given excellent maintenance by the Water Department's employees. The careful attention given to the steam pumps gave them a useful life far beyond the average. [38] The oldest pump in the station, the 1898 Worthington vertical, triple expansion, low service engine (named "Old Tom" by station employees after Thomas L. Amiss), was not taken out of service until the 1960s. The second oldest engine, the Worthington horizontal, triple expansion, high service engine, was operated on line until the late 1970s and was still available for standby service in 1980. Thus these engines, through careful maintenance and loving care, were given a life of seventy to eighty years, when the normal life of steam pumping engines was only around thirty years.

The careful maintenance given the steam engines at McNeil kept them operative. The relatively low price of the fuel that heated their boilers kept them economically competitive with electric power. The McNeil Station switched from coal to natural gas between 1905 and 1909, and natural gas was long a relatively cheap fuel in northern Louisiana. Because the McNeil engines were kept in good operating order and burned a relatively cheap fuel, the cost of replacing the steam pumps with electric pumps long remained too high to be a reasonable investment.

Steam pumps, moreover, long had operating advantages over electric pumps in direct pressure systems like Shreveport's. Electric motors operate best and most efficiently at constant speed, and hence electric powered pumps operate most effectively when they can pump a constant volume of water into the system. A direct pressure system, however, requires the pumping station to vary the volume of water pumped into the line according to consumption trends, and it was far easier to adjust the speed of the McNeil Station steam pumping engines than the speed of motor driven pumps. Thus even after motor driven pumps had begun to pump most of the water into the mains of the city, the steam driven pumps still had utility, for they allowed the motor driven pumps to operate at constant speed while they took care of the varying load at the peak of the consumption curve. [39]

Thus a combination of factors -- the depression, location, good maintenance, loving care, low fuel prices, the expense of replacing well-maintained and operable engines, the advantages of steam pumps for variable speed operation, and the advantages of a dual power source -- combined to insure the survival of the McNeil Street Station with its turn-of-the-century steam pumping engines well into the second half of the twentieth century.

Electric pumps first began to penetrate the McNeil Station in the 1940s. In 1943 a 6 mgd low service electric pump was installed in the new (1921) pump pit in the pump house, and in 1951 another was installed on top of the pit. The high service at McNeil was supplemented by the installation of a 6 mgd electric pump in the late 1940s and by a second pump around 1960. The growing load taken by the Cross Lake plant and the newer electric pumps enabled the Water Department in 1957 to place the steam-powered low service

pumping units on standby service. By the 1970s additional low service electric pumping units had been added and the steam low service pumps were retired, but left in place rather than scrapped.

The high service steam pumps, more useful because of their versatility in variable speed operation, continued in use through the 1950s, 1960s, and 1970s. In the 1970s, however, age began to catch up with them as well. Maintenance and repairs became increasingly more frequent and more expensive. Spare parts were no longer available and often had to be either fabricated in McNeil's machine shop (placed in the old "coal shed" wing) or special ordered from local machinists. The drastic rise in natural gas prices in the mid-1970s made the steam plant at McNeil even less economical. This, coupled with the declining efficiency of the boilers, condensers, and feed water heaters, soon made fuel costs for the steam engines prohibitive. A study of 1977 fuel costs indicated that the steam pumps at McNeil had pumped only 18% of the water from the station, yet had accounted for 87% of the station's fuel costs. [40] Fuel costs had become so high that it was, finally, much more economical to purchase new electric pumps than to operate the old steam pumps, and the installation of several diesel engines at Cross Lake had at least partly reduced their utility for providing emergency service.

Thus, consulting engineers who investigated the McNeil Street plant in 1978 recommended abandonment of the steam pumping engines and the installation of an all-electric outdoor pumping station at McNeil. [41] The new pumping plant was erected in 1978-1979. Its five new 4 mgd pumps (two constant speed, three variable speed) were placed outside of the existing pump building in open air adjacent to the clear water well. In 1979 McNeil's steam pumps were placed on standby duty, and the new electric pumps put into operation. The steam pumps remained on standby duty for about a year while arrangements were made to operate the new electric pumping station both locally and remotely from the Cross Lake plant (renamed the Thomas L. Amiss Water Treatment Plant in 1963 in honor of the man who had been Superintendent-Engineer of the system for more than forty years).

In August 1980, as work on the electrification project neared completion, McNeil's steam pumps were completely shut down and finally taken out of service. For some of the engines, it was time for retirement. Robert M. Vogel, Curator of the Smithsonian's Mechanical Engineering Division, reported in 1980 that the two vertical and one horizontal, direct-acting, Worthington pumps at the station were, as far as he knew, "the sole survivors of the two types in the U.S., in or out of service." [42]

McNeil's growing obsolescence in the post-1950 era was a relatively minor problem for the Water Department and the city official (the Commissioner of Public Utilities) who supervised it. It was largely an internal problem, a problem which was soluble within the confines of the Water and Sewerage Department, a problem which required, usually, only rubber stamp action by the City Council as a whole.

Most of the problems faced by Shreveport's water supply system between 1926 and the 1960s were problems of this nature. In the 1960s and 1970s, however, the long era during which the water supply system had been able to

operate free from controversy and political entanglements came to an end. It came to an end not because the Superintendent-Engineers in charge of the system had begun to dabble in politics, for both Thomas Amiss and his successor, Charles B. Foster, made every attempt to keep the operation of their department non-political. It came to an end, instead, because of the emergence of a new concept in public health and because city growth had begun to place serious strains, both directly and indirectly, on Cross Lake.

THE FLUORIDATION CONTROVERSY

One of the issues which injected politics into water supply decisions was fluoridation. The addition of chemicals to water supplies was nothing new. As we have seen, alum and lime were added to Shreveport's water in 1890 as an aid in mechanical filtration. Disinfectants (bleaching powder and, later, liquid chlorine) were in use by 1911. In later years other chemicals like carbon, copper sulfate, and potassium permanganate were added to clear up taste, color, or odor problems. None of these caused controversy. They were additives that were absolutely necessary to provide safe and drinkable water. The addition of fluorides to prevent tooth decay, which began to be considered shortly after World War II, on the other hand, represented a step further. [43] It was a chemical that was not necessary to make water drinkable or to prevent the spread of serious communicable diseases. Water was safe and potable without it. Instead of merely cancelling bad effects, as earlier chemical treatments had, supporters claimed it added a good one. The idea that public drinking water should do something beyond quenching thirst in safety was a rather radical new concept in public health. It is not surprising that controversy ensued, especially since there were potential dangers (over-dosage).

In late 1951 the Public Health and Sanitation Committee of the Shreveport Chamber of Commerce, after studying data on the advantages of fluoridation, recommended its use in Shreveport's water system. When members of the Chamber approached the City Council, they were apparently told that an item on fluoridation would be included in the 1953 budget, but that their request was too late for the 1952 budget. [44]

In November 1952, when fluoridation was not included in the 1953 budget, the General Manager of the Chamber of Commerce, Harold Bryant, wrote Joe Pratt, then Commissioner of Public Utilities, asking the Council to live up to its promise. [45] Pratt announced in May 1953 that plans were being formulated for fluoridating the city's water supplies by January 1, 1954. [46] But only in October 1954, at the request of the Council of Dental Health of the Louisiana State Dental Society, the Council of Dental Health of the 4th District Dental Association, the Shreveport Medical Society, and the City Board of Health, did the City Council by a 5 to 0 vote authorize the Commissioner of Public Utilities to call for bids on fluoridation equipment. [47] This action was largely in the tradition of Council action on water supply issues over the past several decades -- largely a rubber stamp of the Commissioner of Public Utilities' recommendation.

Opponents, charging that fluoridation was "mass medication", that the government had no right to force medication on people, and that it was a step towards "socialism or even communism," reacted quickly. They . . .

argued that fluoridation was "water-poisoning," "criminal insanity," and "sure national suicide." [48] Within two weeks of the Council's resolution they had secured an injunction restraining the city from accepting bids on fluoridation equipment while the courts decided whether the city had the right to impose fluoridation on its citizens. [49]

In 1953 and 1954 the case worked its way up to the Louisiana Supreme Court which held, in a landmark decision on the issue, that a city had the right to protect public health and that fluoridation fell within the limits of this right. [50] But Shreveport's governing body and its Commissioner of Public Utilities did not take advantage of the decision. They had apparently been completely surprised by the strong feeling the fluoridation issue generated and, for political reasons, decided to let the sleeping dog lie. [51]

The fluoridation issue remained dormant until early 1973 when area dentists again asked that the city's waters be fluoridated. Mayor Calhoun Allen passed the matter on to the Public Utilities Commissioner, Bill Collins, who again let it die. [52] But in February 1977 the Chamber of Commerce appointed a task force to review the issue. [53] The Chamber's report, released in May, strongly supported fluoridation, noting that its cost was low and that evidence overwhelmingly indicated that it was both safe and effective. [54]

Opponents of fluoridation again reacted quickly. Even before the Chamber's report was released they had organized the Shreveport Pure Water Association. [55] When newly-elected Public Utilities Commissioner Billy Guin, an outspoken advocate of fluoridation, announced in July that he would ask the Council to appropriate \$10,000 for final engineering studies on the fluoridation of Shreveport's water supplies, he was immediately challenged to a public debate on the issue by the Shreveport Pure Water Association. [56] This debate, held on July 25, was largely attended by opponents of fluoridation and quickly degenerated into mud slinging and jeering. It culminated with a struggle between Guin and John Yiamouyiannis, a nationally known anti-fluoridationist speaker from the Washington, D.C., area, for the microphone. [57]

The following day Guin, as planned, asked the City Council for \$10,000 for the engineering study. Shreveport's Mayor, Calhoun Allen, was already known as a strong opponent of fluoridation, [58] but Guin had hopes of carrying two of the other three members of the Council. He was disappointed. The Council hedged. Guin's original resolution was rejected. Instead the Council approved only \$5000 for a preliminary engineering recommendation and called for more study and a public hearing on the issue. [59] The Council's rejection of the advice of its Public Utilities Commissioner on a water supply matter, and its refusal to take a decisive stand on the issue were prompted by two related factors -- the recognition that fluoridation was a very emotional issue and the city's impending switch from the Commission to the Strong Mayor form of government. Several commissioners had hopes of becoming the first mayor under the new form of government and did not care to offend a very strong and vocal fraction of the voting population. [60]

The Council's compromise, however, satisfied no one. The Chamber of Commerce and local papers criticized the city fathers for failing to decide the issue by themselves on the basis of available evidence. [61] Anti-fluoridationists, fearing the \$5000 appropriation was but the first step to fluoridation, immediately began to collect signatures to force a referendum banning fluoridation. [62] Even Billy Guin, the Public Utilities Commissioner, seriously considered organizing a referendum campaign of his own, either to go over the heads of the other Council members [63] or to insure that the ballot on the fluoridation issue was not misleading or confusing. [64]

At the August 16, 1977, public hearing both sides made their case to a standing room only crowd. Proponents of fluoridation argued that it was a safe, effective means of preventing tooth decay, with no harmful side effects. The anti-fluoridationists charged that fluoridation did not reduce tooth decay and could lead to a wide range of harmful side effects, the most frightening being a sharp increase in cancerous tumors. [65]

Even though the public hearing had been ostensibly to inform the Council, it was clear that by this point the decision on fluoridation had been taken not only out of the hands of the Water Department and the Commissioner of Public Utilities, but of the City Council as well. The Shreveport Pure Water Association announced at the meeting that it had more than enough signatures to force a referendum on the subject. Although 10% of the registered voters, or 7780 signatures, were needed, the Association announced it intended to have 10,000 before the petitions were submitted to the Council. [66] When the Association submitted its petitions on September 1, 1977, it had 10,300 signatures. [67]

The anti-fluoridation campaign was well organized and well planned. As the election approached there was a massive newspaper and telephone campaign designed to convince voters of the dangers of fluoridation. Nearly 25,000 copies of a special "election edition" paper called the Shreveport Citizen were distributed. [68] This paper contained dozens of short items reporting evidence which supposedly linked fluoridation with cancer. Newspaper ads published by the Shreveport Pure Water Association since July warned that fluoridation was "forced medication," that cities which had earlier adopted fluoridation were now rejecting it because of the link with cancer, and that the Water Department would have to increase rates to pay for the new service. [69] Finally, the wording of the referendum ballot was, as Guin had feared, misleading. The petitions circulated by the Shreveport Pure Water Association had called for a ban on fluoridation. Thus, the ballot called for a vote for or against a fluoridation ban. If you favored fluoridation, you had to vote no. If you opposed fluoridation, you had to vote yes. [70]

The efforts of the Shreveport Pure Water Association were resisted by several pro-fluoridation groups. The local dental and medical associations strongly supported fluoridation and patiently attempted to refute on a point for point basis the charges that fluoridation led to harmful side effects on kidneys, heart, bone marrow, liver, teeth, and so on. [71] Both major local newspapers, the Shreveport Times and the Shreveport Journal,

strongly supported fluoridation. [72] Finally, the Citizens for Fluoridation filed a suit protesting the confusing and ambiguous wording of the referendum ballot, but the suit was dismissed. [73]

Off-year elections in Shreveport usually draw only small turnouts. Only 4 to 10% of registered voters were expected at the polls on November 22, 1977. But 28.3% of those registered voted in the fluoridation referendum election. [74] Generally older people, lower income families, and families with few children voted against fluoridation. The better educated, the wealthier, the young, and people with large families voted for it. [75] The attempt to permanently ban fluoridation of the city's water supply failed by a narrow margin: 10,413 (46.4%) voted for the fluoridation ban; 12,037 (53.6%) voted against the ban. [76] The effects of the massive, well-directed anti-fluoridation campaign were obvious. Polls earlier in the year had indicated that 70% of Shreveporters favored fluoridation. [77]

Despite the results of the November 1977 referendum, Shreveport's water supply system was not fluoridated until nearly mid-1980. Bids were awarded in April 1978, but delays in the shipment of necessary equipment and installation problems delayed matters. [78]

THE I-220 BYPASS ISSUE

More serious in the long run than the fluoridation problem were two related problems which involved Cross Lake and which drew the Department of Water and Sewerage and the city into an even more complicated web of political and legal entanglements. These were the dual problems of finding a supplement for Cross Lake supplies and protecting Cross Lake from contamination.

The problem of contamination of water supplies was an old one for Shreveport. The Shreveport Water Works Company, for example, had been criticized in the first decade of the 1900s for continuing to use water from Cross Bayou after city growth had subjected it to sewage contamination. This problem had been eliminated with the opening of Cross Lake in 1926. Cross Lake was located west of the populated areas of the city; the city drained away from its watershed; and, as further measure of insurance, the city had passed stringent sanitary regulations to protect the reservoir. These factors gave the city a long respite from contamination worries. Even the spread of residential developments to the shores of the lake in the 1950s posed little threat to the purity of the supply because of the installation of adequate sewerage systems and the continued enforcement of the strict sanitary regulations.

But by the 1960s city growth had begun to pose another threat to the purity of Cross Lake, a threat which did not involve bodily wastes, as in the early twentieth century, but toxic chemicals being transported overland. This threat first appeared in 1964 when highway engineers, planning a bypass around the north side of Shreveport (I-220) to relieve a major traffic congestion problem, selected a route which crossed the eastern end of Cross Lake near the intakes of the McNeil and Amiss plants.

The Louisiana Highway Department presented its case for the route selected for the I-220 bypass at a public hearing on December 15, 1964. Highway Department engineers argued that the route they had selected was the cheapest of the alternatives and was the only one that would really solve the city's increasingly more urgent traffic needs. But the selected route brought an angry reaction from a number of people. Among those who spoke against it were the Commissioner of Public Utilities (L. Calhoun Allen) and Charles B. Foster, Amiss' successor as Superintendent-Engineer of the city's water and sewerage system. They pointed out, either at the hearing or on later occasions, that Cross Lake was the sole source of the city's water supply and that an accident on the proposed bridge over Cross Lake involving vehicles carrying toxic chemicals would completely deprive the city of water. They pointed out, also, that the period of deprivation would be long because Cross Lake had no out flow during the summer months and could not purify itself quickly like a river. In addition, they feared that the deep pilings necessary to put the bridge piers on solid foundations might open up salt springs or abandoned oil or gas wells, leading to possible contamination of the city's sole water supply from yet another source. [79]

Highway engineers attempted to meet these objections by more extensive geological studies, by the use of a self-contained drainage system on the bridge, and by the prohibition of vehicles carrying toxic chemicals from the bridge. But opponents, fearing poor enforcement of traffic regulations and accidents which might throw barrels of agricultural or other chemicals over the side of the bridge, were not quieted. [81] The I-220 bypass was built up to the edge of Cross Lake along the highway department's projected route, but injunctions have prevented completion. The affair, in the meantime, had unpleasant repercussions on the management of the city's water supply system.

Traffic congestion in Shreveport, particularly along I-20, had made opposition to the I-220 bypass increasingly unpopular by the late 1960s and early 1970s and a political issue. [82] The Charles Foster case provides an excellent example of how the pressure of population growth and subsequent traffic demands destroyed the long period of freedom from politicization enjoyed by the Water Department after the completion of Cross Lake.

Between 1918 and 1971 Shreveport's Water and Sewerage Department had had only two Superintendent-Engineers -- Thomas L. Amiss from 1918 to 1962 and Charles B. Foster, Jr., from 1962 to 1971. Further continuity had been assured by Foster's long apprenticeship in the department. Born in Hope, Arkansas, and educated at Texas A & M, Foster had been hired by the Shreveport Water Department in 1939. In 1948 he was named Chief Engineer-Assistant Superintendent. In this position from 1948 to 1962 he had often assumed the responsibilities of Superintendent-Engineer as Amiss' health declined. [83] Although the city's charter made it necessary to renominate Amiss and Foster annually, between 1918 and 1970 reappointment had been routine. The long tenures of Amiss and Foster provided the Water Department of the city with continuity and stability through a long succession of elected Commissioners of Public Utilities of varying degrees of competence and incompetence. They had shielded the upper echelons of the Water Department from politicization, and the staffs which Amiss and Foster had put together had brought the city's water system national recognition. According to

the Shreveport Journal Shreveport was cited by the American Water Works Association in 1964 and 1967 as having the outstanding water system in "this part of the country." [84]

Foster's opposition to the I-220 hypass, however, had made him enemies despite his excellent record as Superintendent-Engineer and despite the fact that his position on the I-220 issue had no effect on the efficiency of the water system. [85] In 1970 Bill Collins, an advocate of the I-220 Cross Lake bridge who had called for Foster's replacement, was elected Public Utilities Commissioner. Shortly after the election Collins charged that Foster's continued opposition to the bridge was "political" and that due to this and other areas of incompatibility which existed between he and Foster, he would not renominate Foster for the post of Superintendent-Engineer. [86] Foster was forced to resign after more than thirty years of service in the city's water system, despite protests from numerous area residents. [87] As in the case of fluoridation, a decision respecting Shreveport's water supply system had been determined neither by the Water Department, nor on the basis of technical merit, but on the basis of political expediency.

THE PROBLEM OF SUPPLEMENTARY SUPPLIES

Related in some ways to the I-220 controversy was the problem of supplementing Cross Lake's supplies. During the 1960s Cross Lake was almost the exclusive source of the city's water, especially during the summer months. Much of the opposition to the hypass route centered on the fact that in case of an accidental spill of toxic chemicals into the lake, there was no alternative supply available. The search for alternative supplies, like the I-220 and fluoridation controversies, was in the 1970s to increasingly interrupt the orderly, routine operation of Shreveport's water system and was to involve the city in a complex of political and legal complications. Like the I-220 affair, one of the basic factors behind Cross Lake's deficiencies was city growth and the pressures it placed on the supplies available from the lake.

As already noted, the completion of the Cross Lake project in 1926 provided Shreveport with a welcome respite from worries about the quality and quantity of water available to the city. Cross Lake provided soft, pure water of high quality in abundant quantity. Both engineers and city officials expected the lake to provide sufficient water for a city of 250,000 to 300,000 when it was completed. [88] Since Shreveport in 1926 had a population of only around 60,000 people, it seemingly could afford a long period of complacency.

It was, however, not at all uncommon for the planners, promoters, and builders of water supply systems to overestimate the life of their supplies and underestimate future consumption trends. In Boston, New York, Philadelphia, Baltimore, and elsewhere municipal statesmen had sat back and congratulated themselves after building or expanding their water works on providing for their cities' needs for generations to come, only to find that rarely were the systems adequate even for a single generation. [89] Such was the case with Shreveport.

The first disturbing news about the adequacy of Cross Lake's supplies came from the review of Shreveport's water system by the Kansas City engineering firm of Burns & McDonnell in 1941, at a time when the city's population was only around 100,000, far from the 250,000 to 300,000 capacity predicted for Cross Lake. After a close study of meteorological data, anticipated city growth, water consumption trends, and Cross Lake's capacity (somewhat increased over 1926 by the use of 2 foot high wooden flash boards placed on the crest of the spillway structure), Burns & McDonnell found that a drought of the severity of the 1924-1925 drought would limit the water available at the intake to an average daily draw of 14.8 mgd, barely the anticipated use in 1950, when the city was expected to have a population of only around 125,000. [90]

The Burns & McDonnell report, however, was primarily concerned with the relatively short term problem of increasing pumping and purification facilities to provide sufficient water to the city in 1945, not with the long range problem of future supplies. This, the coming of World War II, and the absence of a prolonged drought encouraged city fathers to ignore the threat of water shortage. The 1950 census gave the city 127,206 people, still far from the originally predicted capacity of Cross Lake, but at the point Burns & McDonnell had warned of. The Cross Lake supply was still more than adequate, but only because there had not been another drought like that of 1924-1925.

In 1952 the city retained Black & Veatch, successor to the old firm of Worley & Black and a prominent Kansas City public works consulting firm, to review Shreveport's water distribution system. The Black & Veatch report warned that, even barring a drought, Cross Lake would only provide adequate supplies until around 1957 and concluded:

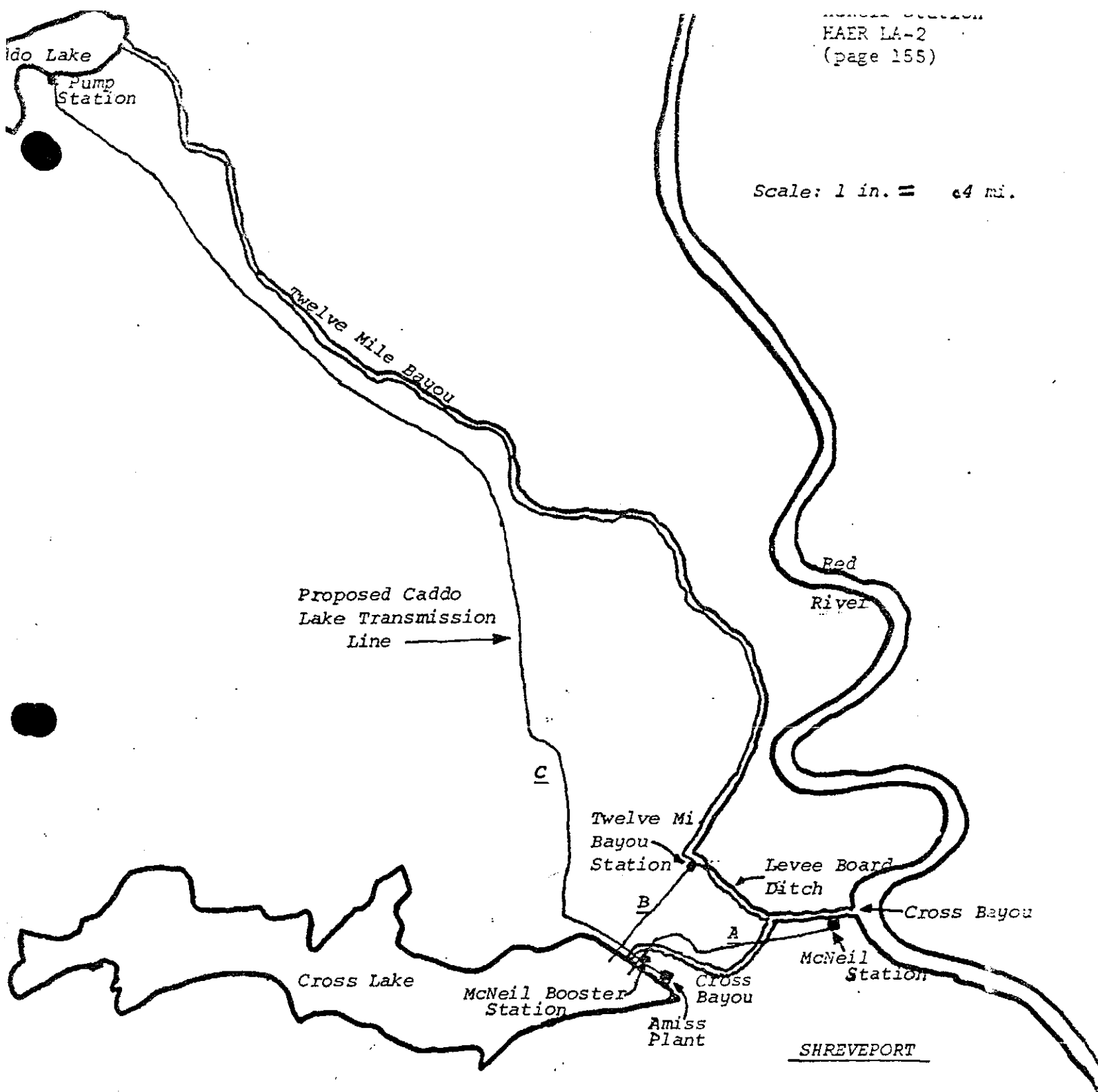
It is clearly evident that Shreveport must develop a supplementary source of raw water supply within a few years if the city is to have a dependable supply of water.

Black & Veatch thus recommended that an independent study of future sources of water be carried out at as early a date as possible. [91]

No action was taken immediately to implement the Black & Veatch recommendation, and in 1954 the drought which Burns & McDonnell had warned of in 1941 hit the area. Cross Lake was not full when heavy use of water began around June 1. For the first time in decades the city was compelled to restrict the use of water. [92] The crisis, fortunately, was relatively short lived. But it was sufficient to stir the city to action before a more severe problem emerged. In the spring of 1955 the City Council submitted to the voters a \$19,000,000 bond issue for municipal improvements. Additions to the water system, largely designed to correct the Cross Lake water shortage, accounted for \$5,000,000 of the issue. [93]

The most important of the water works improvements financed with the proceeds of these bonds were the construction of a 8500 foot long, 60-inch diameter concrete pressure conduit leading from Twelve Mile Bayou to Cross Lake and a pumping station with a rated capacity of 100 mgd on the bayou

Scale: 1 in. = 4 mi.



- A: 30" conduit to McNeil Station
- B: 60" Feeder from Twelve Mile Bayou
- C: Proposed 60" Conduit from Caddo Lake

Table 18: Supplemental Supplies for Cross Lake

Wallace Lake
c. 14 mi.

(see Table 18). This system was used to pump excess water from Caddo Lake flowing down the bayou in the spring into Cross Lake to insure that it was full before the start of the heavy usage season. Money from the bond issue was also used to construct a new booster station for the McNeil Station conduit and a new 4 million gallon underground storage reservoir. [94]

These improvements gave the city another breathing space. Cross Lake, when full, could provide an estimated dependable daily draft of 33 million gallons, up from around 15 million gallons (1954 conditions). [95] In 1957 when the Twelve Mile Bayou conduit was completed the city was using only an average of around 20 mgd. [96] But the period of respite allowed by the Twelve Mile Bayou conduit was significantly shorter than the period granted by the completion of Cross Lake. Cross Lake had provided the city with sufficient water from 1926 to 1954, a period of twenty-eight years. Only a decade after the Twelve Mile Bayou conduit was installed the city again had to begin to take steps to tap additional supplies, despite the installation of radial arm crest gates to the Cross Lake spillway in 1962. This modification added 3 feet to the height of the dam and increased the lake's storage capacity to around 26 billion gallons.

The most significant problem with the Twelve Mile Bayou pipeline was that water was available for pumping only in spring. In the summer when use was heaviest Cross Lake supplies alone had to be sufficient for Twelve Mile Bayou was low and could not be used as a supplement. The biggest single item in the capital improvements bond issue of 1968 was \$6,000,000 for a pumping station on Caddo Lake and a 100 mgd, 17 mile long, 48- or 60-inch conduit to lead water from that station to Cross Lake. [97]

In March 1968 the City Council approved the purchase of a tract of land for the Caddo Lake pumping station. [98] Work began on the project with completion expected either in late 1970 or early 1971. Eventually the city purchased 85% of the necessary right-of-way, constructed the pump station building on Caddo Lake, and laid 500 feet of conduit. [99] But the project was never completed. The 1972 U.S. Clean Water Act forced the city to begin treating its sewage, hitherto allowed to flow freely into the Red River. Money intended for the Caddo Lake project was diverted to the construction of a sewage treatment plant. [100]

In 1978, as the water supply situation became more threatening, the city's voters approved a \$30,000,000 public improvements bond issue, with the understanding that \$17,700,000 of this money would be used to complete the Caddo Lake pipeline project. [101] Although legal problems had arisen over tapping Caddo, Public Utilities Commissioner Billy Guin felt the city should take a "calculated risk" and build the conduit anyway. [102] But his wishes were not fulfilled, and it now appears that this work may never be completed. Legal actions taken by Texas cities (Caddo Lake straddles the Texas-Louisiana border) and north Caddo Parish communities have tied the issue up in the courts, and the modifications necessary to raise the Caddo Lake dam and make the lake a reliable reservoir threaten not only to be expensive and time consuming, but likely to create environmental problems and lead to only more litigation. [103]

With the Caddo Lake pipeline hlocked by the courts, Shreveport's Water Department in 1979-1980 began construction of a low water dam on Twelve Mile Bayou, adjacent to the 1957 pumping station. This dam is designed to create a small impounding reservoir and provide some supplementary supplies for Cross Lake from the bayou during the summer months. Construction was also begun in 1979-1980 on a pipeline to directly link the Amiss Station to the Twelve Mile Bayou pipeline, so that Cross Lake could be hypassed and the city provided with an emergency supply of water should something happen to contaminate Cross Lake as the opponents of the I-220 bypass feared.

Although it is possible that Shreveport some time in the next decade may be able to draw a larger portion of Caddo Lake's water, directly or indirectly, even this supply would be sufficient only to the year 2000. Then the search for additional supplies would have to begin anew. Wallace Lake, just south of Shreveport; the Toledo Bend reservoir, 50 miles to the south on the Louisiana-Texas border; and the Red River are all possible supplies, the latter since the Army Corps of Engineers' Red River project has eliminated some of the salinity and hardness problems that long plagued that stream. [104]

The growing demands of other municipalities for water, environmental activism, the red tape and inertia of modern governmental bureaucracies, and today's more frequent and complex legal manoeuverings, however, will probably mean that never again in the foreseeable future will Shreveport have, in the water supply area, an era of tranquility and stability as long as that she enjoyed following the completion of the Cross Lake project in 1926.

1. J.N. Chester Engineers, "Report on Supplementary Water Supply for Shreveport, Louisiana," July 1929, p. 7: "While we have frequently characterized your Cross Lake Supply, both as to quantity and quality, as one of the ten best in the United States . . ."
2. Shreveport City Council, Biennial Report, 1923-1924, p. 62 (Amiss' estimate of 250,000); Biennial Report, 1925-1926, p. 54 (Mayo's estimate of 300,000); "Shreveport Project Nearly Completed," p. 1157 (anonymous estimate of 250,000).
3. Figures on average pumpage are from Burns & McDonnell Engineering Company, "Report on Water Works and Sewerage System Improvements, Shreveport, Louisiana," 1941, p. 8, and Black & Veatch, "Report on Water and Sewerage Facilities for Shreveport, Louisiana," 1961, p. 4.
4. For figures on per capita use see Chester, "Report," 1929, p. 1. The per capita consumption was 78 gpd in 1926; in 1928 the figure was 85 gpd.
5. Shreveport City Council, Minutes, February 28, 1922, and January 11, 1927.
6. Amiss to W.T. Mayo, Commissioner of Public Utilities, November 6, 1926 (files in McNeil Street Station).
7. Amiss to Mayo, November 6, 1926 (McNeil files); Shreveport City Council, Minutes, December 14, 1926; Times, November 19, 1926.
8. Tulsa Daily World, November 16, 1926.
9. Amiss to W.F. Anderson, Superintendent, Department of Water and Sewerage, Tulsa, Oklahoma, May 10, 1927 (McNeil files).
10. Amiss to Mayo, July 22, 1930 (McNeil files).
11. Chester, "Report," 1929, p. 2; Shreveport City Council, Minutes, August 28, 1928. The issue of supplying water to Bossier was first brought up in 1922 (Shreveport City Council, Minutes, January 11, February 23, and February 28, 1922). Shreveport supplied Bossier's water until 1959.
12. In 1928 average daily water consumption was 6.77 mgd, with maximum daily demand running over 10 mgd (Chester, "Report," 1929, pp. 1-2). The gravity flow capacity of the conduit was only 10 mgd, and the capacity of the purification plant in 1928 was only around 8.5 mgd.
13. J.N. Chester Engineers, "Report on Supplementary Water Supply for Shreveport, Louisiana," July 1929, 11 pp.
14. Shreveport City Council, Minutes, August 27, 1929.
15. "Report of H.E. Barnes, City Engineer, -to- Water Board and City Council, Shreveport, Louisiana, September 14th, 1929, relative to New Water Plant on the Shores of Cross Lake," 11 pp. (Copy in Charles B. Foster Collection)

16. Shreveport City Council, Minutes, October 8 and October 22, 1929.
17. Ibid., October 22, 1929; Amiss, "Water Works Revenue Takes Care of Bond Issue for Improvements," Water Works Engineering, v. 83 (1930) p. 883; and "Offering of \$500,000 Water Works Bonds of the City of Shreveport, State of Louisiana," 7 pp. (Shreveport, 1929) (copy in Charles B. Foster Collection).
18. Shreveport City Council, Minutes, December 18, 1929.
19. Ibid., February 25, 1930.
20. For a description of this work see Amiss, "Water Works Revenue," pp. 883-884, 915-916, and "Shreveport Completes Improvement Program," pp. 1669-1670, 1695-1696.
21. "Cross Lake Plant Dedication," June 6, 1931 (pamphlet, Charles B. Foster Collection); Times, June 6, 1931.
22. Amiss, "Water Works Revenue," p. 884.
23. Burns & McDonnell, "Report," 1941, pp. 43-44 and fig. 4.
24. National Board of Fire Underwriters, Committee on Fire Prevention and Engineering Standards, "Report on the City of Shreveport, LA.," September 1951, p. 5.
25. Burns & McDonnell, "Report," 1941, pp. 8-9.
26. This information was gathered through interviews with some of the people who worked at the station during the 1930s and after (e.g. Lee Hollifield).
27. Shreveport City Council, Minutes, August 8, 1939.
28. Amiss, "History of Shreveport Waterworks," p. 36.
29. Shreveport City Council, Minutes, January 25, 1938.
30. Data from Burns & McDonnell, "Report," 1941, p. 8.
31. Shreveport City Council, Minutes, January 31, 1941. For a sketch of the history of Burns & McDonnell see Lynch, "Kansas City's Pioneer Engineers," p. 5.
32. Burns & McDonnell Engineering Company (Kansas City), "Report on Water Works and Sewerage System Improvements, Shreveport, Louisiana," 1941, 130 pp. plus maps and charts.
33. Interview with A. Adler Hirsch, ex-superintendent of water purification.

34. According to Demcoulos & Ferguson, Inc. (Consulting Engineers, Shreveport), "Comprehensive Water and Sewer Plan -- Shreveport Standard Metropolitan Statistical Area," October 1, 1972, p. 73, McNeil was still purifying around 20% and pumping around 25% of Shreveport's water.
35. The importance of McNeil's location is noted in practically every engineering study of Shreveport's water system: Chester, "Report," 1929, p. 6; Burns & McDonnell, "Report," 1941, p. 56; Black & Veatch, "Report," 1952, pp. 19-20; Black & Veatch, "Report," 1961, p. 15; and Black & Veatch, "Report," 1969, p. 16.
36. For example, Shreveport, Department of Public Utilities, "Shreveport, Louisiana . . . City on the Grow," pamphlet, c1964, notes that because of the dual power system: "Shreveport has a higher assurance of continuity of water service than most cities, a fact of which the city is justly proud." See also: Chester, "Report," 1929, p. 7, and Amiss, "Water Works Revenue," p. 884.
37. Interview with Charles B. Foster, summer 1980. The installation of diesel engines for emergencies at Amiss in 1969 reduced the benefits provided the system by McNeil's steam engines.
38. Interviews with Lee Hollifield (formerly chief engineer at the McNeil Station) and Charles B. Foster, as well as other older employees of the Water Department.
39. Black & Veatch, "Report," 1952, p. 24 and fig. 3, indicate that the Cross Lake Station generally pumped a uniform load, while McNeil, due to its steam pumps, handled the variable loading above the Cross Lake load line.
40. Aillet, Fenner, Jolly, & McClelland, Inc. (Shreveport), "Report on Electrification of McNeil Street Water Treatment Plant for Shreveport, Louisiana," 1978, pp. 10-11.
41. Ibid.
42. Robert M. Vogel, "The McNeil Street Pump Station, Shreveport, Louisiana: Its Potential as a Museum," manuscript report for the National Architectural and Engineering Record, 8 pp.
43. Baker, Quest for Pure Water, pp. 460-463, briefly reviews the emergence of fluoridation.
44. This information is mentioned in a letter from Harold J. Bryant, General Manager, Shreveport Chamber of Commerce, to Joe Pratt, Commissioner of Public Utilities, November 21, 1952, recorded in Shreveport City Council, Minutes, November 25, 1952. See also Times, November 26, 1952.
45. Bryant to Pratt, November 21, 1952, in Shreveport City Council, Minutes, November 25, 1952.
46. Times, January 3, 1954.

47. Shreveport City Council, Minutes, October 13, 1953.
48. For examples of the rhetoric used in the struggle against fluoridation in Shreveport in the 1950s see: Tom M. McGuirt to James C. Gardner, Mayor, and the City Council, March 8, 1955 (open letter; copy in the Louisiana State University in Shreveport vertical files); see also Times, January 3, 1954.
49. Shreveport City Council, Minutes, October 27, 1953; Times, January 3, 1954; also Times, January 5 and January 6, 1954.
50. Times, February 18, 1977, reviews the attempt to fluoridate Shreveport's water in the early 1950s and notes the "landmark legal decision" which granted such authority to the City Council.
51. According to the Times, February 18, 1977. The Times, January 3, 1954, noted that Commissioner of Public Utilities Joe Pratt was neutral on the issue of fluoridation and had brought it up at the urging of various organizations, assuming there was no opposition to it.
52. According to the Times, February 18, 1977, in summarizing the history of the fluoridation issue in Shreveport.
53. Times, February 18, 1977.
54. Times, May 20, 1977.
55. Journal, March 17, 1977.
56. For the background to the debate see the article by Craig Flournoy, Journal, August 2, 1977.
57. Times, July 26, 1977; Journal, July 26, 1977.
58. Journal, July 26, 1977.
59. Times, July 27, 1977; Journal, July 26 and July 27, 1977.
60. According to the Journal, August 2, 1977.
61. Times, July 31, 1977; Journal, July 27, July 29, and August 2, 1977.
62. Journal, July 29 and August 1, 1977.
63. Times, August 16, 1977.
64. Journal, August 9, 1977.
65. Times, August 17, 1977; Journal, August 17 and August 18, 1977.
66. Journal, August 17, 1977; Times, August 17, 1977.
67. Times, September 1, 1977.

68. Times, November 15, 1977. A copy of the Shreveport Citizen is in the vertical file of Louisiana State University in Shreveport Library.
69. For example, Times, July 25, November 13, and November 15, 1977, and Journal, August 17, 1977, for the anti-fluoridationist argument.
70. For complaints on the ballot see the editorial in the Times, November 13, 1977, and November 17, 1977; also Journal, November 12, 1977.
71. See, for example, Times, November 13 and November 15, 1977; Journal, August 17, 1977.
72. Times, November 13, 1977; Journal, July 31, November 12, November 18, 1977.
73. Times, November 17, 1977.
74. Times, November 23, 1977.
75. Journal, November 24, 1977.
76. Times, November 23, 1977; Journal, November 23, 1977.
77. Times, March 2 and July 31, 1977; Journal, March 2, 1977.
78. See, for instance, Journal, February 16, March 1, May 31, 1979, and March 4, 1980; Times, October 13, 1979.
79. Times, December 15 and December 16, 1964.
80. For examples of the arguments for the I-220 bypass over Cross Lake see Journal, March 30 and October 20, 1977; September 29 and November 22, 1978; and Times, May 20, 1977, and June 18, 1980. For examples of the arguments against the bypass see Journal, January 8, 1976; March 30 and November 7, 1977; Times, September 18, November 13, and November 20, 1977; November 19, 1978; February 11, 1979; and June 18, 1980.
81. For example, Times, June 19, 1980.
82. Although I was unable to find a poll on the issue in the late 1960s or early 1970s, a Journal poll in 1977 indicated that 79% favored completion of the I-220 project, only 21% opposed (Journal, September 17, 1977). At about the same time the city's traffic engineer complained that it would be a "black day" for Shreveport if the courts continued to block completion of the bypass since the traffic congestion problem was growing steadily worse (Journal, October 5, 1977).
83. For biographical details on Foster see Journal, January 7, 1970.
84. Journal, January 7, 1970 (mentioned in a biographical sketch of Charles Foster).
85. For favorable comments on Foster's record see the editorial in the Journal, January 4, 1971.

86. Journal, January 4 and January 20, 1971.
87. For example, Journal, January 20, 1971 (letter of Jack Stringfellow). There are a number of other letters to the editors of both the Times and the Journal in January 1971 protesting Collins' intention of dismissing Foster.
88. For example, W.T. Mayo, Commissioner of Public Utilities in Shreveport, estimated 300,000 in Shreveport City Council, Biennial Report, 1925-1926, p. 54. Thomas Amiss, the Superintendent of the system, estimated that the supply would be adequate for a city of 250,000 in the Biennial Report of 1923-1924, p. 62. The same estimate is made in Shreveport City Council, "Address to the Public on the Water Bond Issue and the Special Tax for Permanent Public Improvements," 1923, 7 page pamphlet in the Charles B. Foster Collection.
89. Blake, Water for the Cities, pp. 265, 268, for example.
90. Burns & McDonnell, "Report," 1941, esp. pp. 22, 57-58.
91. Black & Veatch, "Report on Water Distribution System Improvements for Shreveport, Louisiana," 1952, esp. pp. 7, 19.
92. Shreveport Department of Water and Sewerage, "Water Unlimited: Open House -- Shreveport's \$8,000,000 Water & Sewerage Improvements, September 14-15, 1957," p. 3 (13 page pamphlet); Also Shreveport City Council, Minutes, June 13 and August 24, 1954.
93. Amiss, "Shreveport, La., Spends \$8,000,000 and Ends Water and Sewerage Worries," American City, March 1957 (offprint).
94. Ibid.; Times, October 28, 1956; Shreveport Department of Water and Sewerage, "Water Unlimited"; Orland Dodson, "How a Growing City Stays Ahead of Its Water Needs," Shreveport Magazine, v. 18 (August 1963) pp. 20-21, 46-52; and Black & Veatch, "Report," 1961, pp. 7-8.
95. Black & Veatch, "Report," 1952, p. 19 (dependable yield without input from Twelve Mile Bayou); Black & Veatch, "Report," 1961, p. 7 (dependable yield with input from Twelve Mile Bayou).
96. Black & Veatch, "Report," 1961, p. 4.
97. Journal, March 21, 1968, and March 25, 1969.
98. Journal, March 25, 1969.
99. Times, December 18, 1970, indicated that about half of the total work on the Caddo pipeline project was completed, including the pump station building and 500 feet of conduit laid on the property owned by Shreveport at the pump station site.
100. Times, June 4, 1978.

101. Times, January 22, 1978.
102. Times, June 4, 1978.
103. For the opposition of Texas and north Caddo Parish cities to Shreveport's plans see, for example, Journal, April 6 and April 18, 1978, as well as October 13 and November 14, 1978; Times, June 4, 1978.
104. Future supply options for Shreveport are reviewed by Black & Veatch, "Report," 1961, pp. 18-19 (Red River and Wallace Lake) and by Aillet, Fennery, Jolly & McClelland (Shreveport) and Black & Veatch (Kansas City and Dallas), "Report on Water Works Facilities for Shreveport, Louisiana. . .," 1976, pp. 21-26 (Caddo Lake, Wallace Lake, Red River, Groundwater). See also Times, June 4, 1978, and February 17, 1980, where Toledo Bend is mentioned.

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- B. Works on the general history of water supply, public health, or urban growth
- C. Works on water supply technology

II. Government Documents

- A. Documents published by the City of Shreveport
- B. Documents published by the State of Louisiana

III. Engineering Reports

IV. Archival Documents

V. Newspapers

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*CBF: indicates in the Charles B. Foster Collection of the Louisiana State University in Shreveport Archives

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- . Biennial Report, 1923-1924. (Department of Public Utilities report contained on pp. 57-71) (#)
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- . "Water Supply for Shreveport, Louisiana: A Digest of the Report of Chester & Fleming, C.E., Pittsburgh, Pa.," 1919, 24 pp. (WS)
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B. Documents Published by the State of Louisiana

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"Report on Water Supply for City of Shreveport, Louisiana," March 1919,
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1972, 142 pp. (WS, #)

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Engineering Standards. "Report on the City of Shreveport, LA.,"
September 1951. (#)

Shreveport Water Works Company. "Schedule of Property and Data Prepared for the Use of the Appraisal Board," February 1913. This was originally a manuscript at least 176 pages long. Xeroxed copies of pp. 6-55, 104, 110, 112-113, and 175-176 survive at the Shreveport Department of Water & Sewerage. The original could not be located.

Worley & Black (Engineers, Kansas City, Missouri). "Report on the Physical Value of the Shreveport Louisiana Water & Sewer Systems," December 1911, 173 pp. (*CBF)

IV. ARCHIVAL DOCUMENTS

Foster, Charles B. Collection. Located in the Louisiana State University in Shreveport Archives. This collection contains a number of engineering reports (indicated in the section above) plus a variety of miscellaneous documents (detailed below):

"Agreement between City and Kansas City Southern Railroad," c1924

"Conference Held between City Council and Water Board of Shreveport and Kansas City Southern Railroad," transcript, c1924

J.N. Chester to W.T. Mayo, May 20, 1924, letter suggesting clarifications on the Kansas City Southern Railroad contract for use of embankment as dam

H.R. 5573, 68th Congress, 1st Session, January 16, 1924: Bill granting Shreveport certain public lands for reservoir purposes

George R. Wickham, Acting Commissioner, to General Land Office, Secretary of the Interior, October 18, 1922, letter, 10 pp.

"Report of H.E. Barnes, City Engineer, - to - Water Board and City Council, Shreveport, LA., September 14th, 1929, relative to New Water Plant on the Shores of Cross Lake," 11 pp.

McNeil Street Pumping and Purification Station Records. Several files or boxes of miscellaneous correspondence and records stored in the old chemical laboratory.

Shreveport, Louisiana, Chamber of Commerce. Minutes. In Louisiana State University in Shreveport Archives (noted as * below).

-----, Board of Directors. Minutes. (*)

-----, Executive Committee, Minutes. (*)

Shreveport, Louisiana, City Council. Minutes. (*) The LSU-S Archives also have an index to these records.

Shreveport, Louisiana, Department of Water and Sewerage. Drawing Collection.
Plans and blueprints dating from 1899 to 1940 in this collection have
been placed on indefinite loan with the Louisiana State University in
Shreveport Archives.

V. NEWSPAPERS
(Shreveport)

Daily Caucasian

Daily Standard

Evening Standard

Progress

Shreveport Journal

Shreveport Times

South-Western

New Filters and
Filter House 1942



APPENDIX II: Installation Record for Steam Pumping Engines at McNeill

Year Inst.	No.	Make (high or low service)	Ident. No.	Size	Vert. or Horiz.	Direct Acting or Crank & Flywheel	Engine Type	Condensing or Non- Condensing	Pump Type Simplex or Duplex	Pump Cap. mgd*	Date Retired
1887	2	Blake (low)	?	?	V	DA	Single exp.	Non (?)	S	1	c. 1981-92
	2	Blake (high)	?	14 x 24 x 14 1/4 x 24	H	DA	Compd.	C	D	1	c. 1904
1891	1	Worthington (low)	?	?	V	DA	?	?	S(?)	2	1892
1892/3	1 (??)	Gordon (low)	?	?	H	DA	Compd.	C	?	1.5-2.0	1898
1898	1	Worthington (low)	1251(1897)	12 x 18 x 29 x 15 x 18	V	DA	Triple exp.	C	D	3 (5 af- ter '11)	C. 1957
1900-01	1	Worthington (high)	1661 (1900)	12 x 19 x 30 x 16 1/2 x 24	H	DA	Triple exp.	C	D	3 - 4	1979-1980
1901	1	Worthington (low)	1827	14 x 20 x 21 x 15	H	DA	Compd.	Non	D	4 - 5	c. 1957
1904	1	Blake (high) (used Birmingham, Ala., 1898-1904)	C-1472-A	14 x 24 x 14 1/4 x 24	H	DA	Compd.	C	D	2.5-4.0	1927
1905	1	Worthington (high)	22008(1904)	12 x 19 x 30 x 16 1/2 x 24	H	DA	Triple exp.	C	D	3.6-4.0	c. 1963
1921	1	Worthington (low)	18545	9 x 15 x 24 x 21 x 24	V	DA	Triple exp.	C	D	6	c. 1972
	1	Worthington-Snow (high)	5368 (1920)	18 x 40 x 15 x 36	H	CFW	Cross Compd.	C	D	6	1979-80
1927	1	Allie-Chalmers	846 (1911)	22 x 46 x 14 1/2 x 36	H	CFW	Cross Compd.	C	D	8	1979-80

*The figures given for
pumping capacity vary
widely from source to
source.

Appendix III: Installation Record for Filters at McNeil

Date	Filters no.	Type Filter	Capacity mgd	Date Retired
1890	1-4	Hyatt, pressure (vertical steel cylinder)	0.25	c1951
1900- 1901	5-7	New York, pressure (hori- zontal steel cylinder)	0.75	c1955
		Hyatt filters (1-4) remodel- led with Jewell Collecting and Straining mechanisms		
1904- 1905	8-10	concrete, gravity	0.50	after 1955
1908- 1909		Filters 1-7 converted from pressure to gravity operation		
1910- 1911	11-12	concrete, gravity	0.50	operative
1924	13-16	concrete, gravity	0.75	operative
1942	17-19	concrete, gravity (exterior)	1.5-2.0	operative
1977- 1978	20-21	concrete, gravity (exterior)		#20 operative #21 incomplete

Appendix IV

Shreveport, Louisiana
Population Growth
1840 - 1980

1840	c. 708
1850	1728
1860	2190
1870	4607
1880	8008
1890	11,979
1900	16,013
1910	28,015
1920	43,878
1930	76,655
1940	98,167
1950	127,206
1960	164,372
1970	182,064
1980	213,000 Projected

APPENDIX V: Sources of Shreveport's Public Water Supply, 1887 - 1980

1887-1903: Cross Bayou

1903-1909: Cross Bayou with mixture of water from Twelve Mile Bayou

1909-1911: Cross Bayou with mixture of water from Red River and Twelve Mile Bayou

1911-1926: Red River (water from Cross Bayou, mixed in with water from Twelve Mile Bayou, sometimes used after 1919)

1927-1957: Cross Lake

1957-Present: Cross Lake with some mixture of water from Twelve Mile Bayou